The Foundry

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Something

"I find it the safest"

SAYS

Herbert Larson,
Foundry Superintendent
of the
Minneapolis plant.

Minneapolis-Moline Power Implement Company

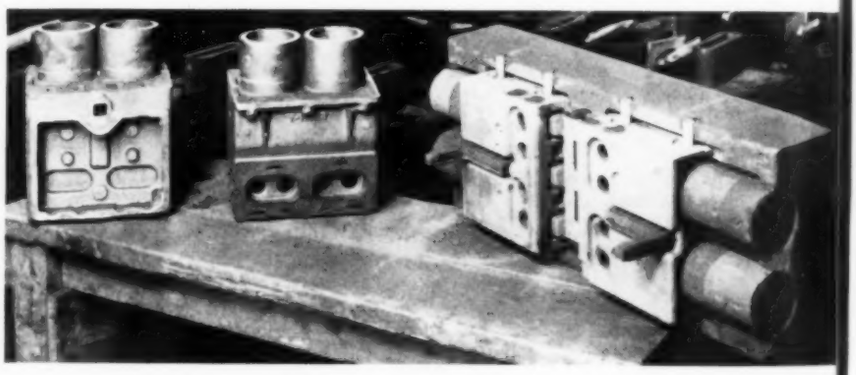
MINNEAPOLIS, MINN.

A ten-year user of Linoil

Minneapolis-Moline Universal "Z" tractor with 4-row cultivator attachment.

Cylinder block for same, weight 61 pounds, dimensions 10″ x 10″ x 12″, made with Linoil.

Crankcase for same, weight 240 pounds, dimensions 20″ x 30″ x 14″, made with Linoil.



Welcome to Cleveland

A. F. A. CONVENTION

May 14th to 19th

THE WERNER G.

(DIVISION OF ARCHER

2191 WEST 110th ST.

Warehous

Boston, Mass.	Philadelphia, Pa.	Columbus, Ohio	Chicago, Ill.
Hartford, Conn.	Birmingham, Ala.	Dayton, Ohio	Moline, Ill.
Edgewater, N. J.	Buffalo, N. Y.	Indianapolis, Ind.	

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The Foundry Editorial

Some Buyers Are Shopping for Bargains in Castings

CONSIDERABLE shopping around for bargains in castings is apparent. Some buyers have taken the business recession as a glorious opportunity to chisel on the prices of castings of all types. Blueprints are being made in quantities and distributed widely, both in and beyond the immediate territory of the organization, with the hope that some foundryman will be willing to give away a part of his plant for the privilege of operating at a little better rate.

Regardless of whether business continues at the present low point for some time, or a marked pickup develops in the very near future, neither the foundry industry as a whole nor individual companies can hope to gain a competitive advantage through bidding on these jobs, so obviously broadcast for mercenary purposes.

Success of Regionals

EXCEPTIONAL interest has been shown in the numerous regional foundry conferences held in various parts of the country since early last October. Beginning with the program at Columbus, O., and continuing through meetings at Rolla, Mo., Iowa City, Iowa, Ithaca, N. Y., Milwaukee, and Birmingham, large numbers of foundrymen have listened to exceedingly valuable technical programs. Two more meetings in April, one at Cambridge, Mass., and the other at Lansing, Mich., promise a special treat for the foundrymen in those districts.

Much credit for serving the foundry industry goes to the sponsoring groups, which include the American Foundrymen's association, the St. Louis Chapter of the A. F. A., Missouri School of Mines, Quad City Chapter of the A. F. A., Northern Iowa Foundrymen's association, University of Iowa, Buffalo Chapter of the A. F. A., foundrymen of Northwestern New York, Cornell university, Milwaukee Chapter of the A. F. A., University of Wisconsin, Birmingham section of the A. S. M. E., Birmingham Chapter of the A. F. A., New England Foundrymen's association, Massachusetts Institute of Technology, Detroit chapter of the A. F. A., and Michigan State college. Individual members of these groups as well as the companies they represent, have given freely of time and effort to make the regional conferences successful.

Special mention should be made of the new attendance record set at the recent joint conference at Birmingham. Six years ago the Birmingham section of the A. S. M. E. invited the foundrymen of the city and surrounding territory to co-operate in a joint foundry practice meeting. Approximately 300 attended the first meeting and the following conferences were equally successful. The real impetus developed two years ago with the formation of the Birmingham District chapter of the A. F. A., and through the enthusiasm of that organization, the joint conferences at Birmingham should continue to grow. R. R. Deas Jr., chairman of the A. F. A. chapter, George R. Ozley, chairman of the A. S. M. E. section, Lester N. Shannon, past chairman of the A. F. A. chapter and a director of the national association, and the many men who worked on the various committees, are to be congratulated on the successful meeting.

Compulsory Licensing

PRODUCERS of basic commodities, such as castings, should give careful study to a proposed bill, H. R. 9259, now before Congress, which provides for compulsory licensing of patents.

Instead of the patentee or assignee holding exclusive patent rights for 17 years, as at present, the bill provides that three years from the date of issuance of a patent, any person, who provides evidence of financial responsibility, may file an application for a license under the patent with the commissioner of patents. Granting of applications comes under the supervision of the commissioner of patents.

While opinion regarding the proposed law varies considerably, it is interesting to note that groups of patent lawyers and engineers have passed resolutions opposing the bill.

Frank G. Steinbach
Editor

Customers Are M

By PAT DWYER

OLD of course but still usable, the story of the three tailors boasting of their skill. One said that after taking a good look at a man, no measurement of any kind, just a good look, he could make a suit that would fit the man to perfection. The second one-ninth of a man declared he did not even have to see the man. Just give him a glance of a man's coat tails vanishing around a corner or through the door of the nearest pub, and he could tailor him a suit that would fit like the paper on the wall. The third knight of the goose, the thimble and needle deprecated such clumsy and amateurish methods. The ancient and honorable art certainly was falling on evil days when two presumably journeymen mechanics had to resort to practices only worthy of an apprentice. As for he himself, the present speaker no less, all he needed in the way of information was one good look, or at a pinch a post card view of the corner around which the customer had fled!

While it is true that the skill of the modern foundryman does not approach the doubtful and exalted plane on which the third tailor perched complacently with legs nicely crossed to make the perfect *X*, still the demands of modern industry call for a degree of casting perfection that not so many years ago would have been declared outside the scope of practical accomplishment.

Members of the engineering profession, whether pushed from outside, or more inexorably pushed from the inside by their own creative instinct for larger, better, faster or stronger pieces of equipment, cheerfully have conceived and given birth to their brain children and then just as cheerfully have demanded that the foundryman produce castings to meet the most exacting requirements. Tolerances in

Fig. 1 (Above)—One of the many core benches located close to windows. In this view the coremaker is producing cores for ½-inch ells in a multiple aluminum alloy corebox

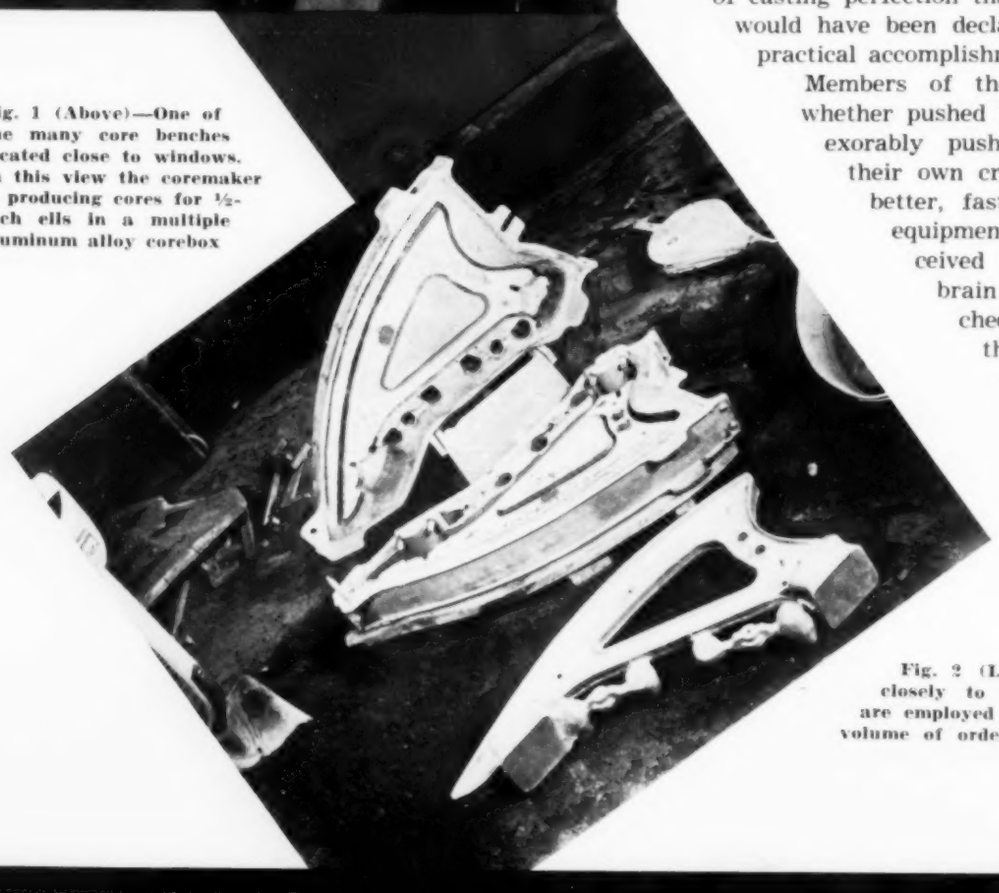


Fig. 2 (Left) — Flasks which conform closely to the contour of the pattern are employed on special castings on which volume of orders received is fairly constant

More Particular

Technique of Making Malleable Castings Changed To Cope With Conditions Of Today

the late Mr. Kipling in contrasting the bow and the hand flung spears with the at that time modern nine point two.

Equipment and methods installed and practiced at the plant of the Columbus Malleable Iron Co., Columbus, O., are fairly representative of the manner in which the industry has kept pace with modern trends and the demands of customers for an increasingly better product. Melting equipment includes three 40-ton capacity air furnaces fired with powdered coal. Eight annealing ovens located in another part of the foundry in close proximity to the cleaning room also are fired in the same manner from a central preparation and

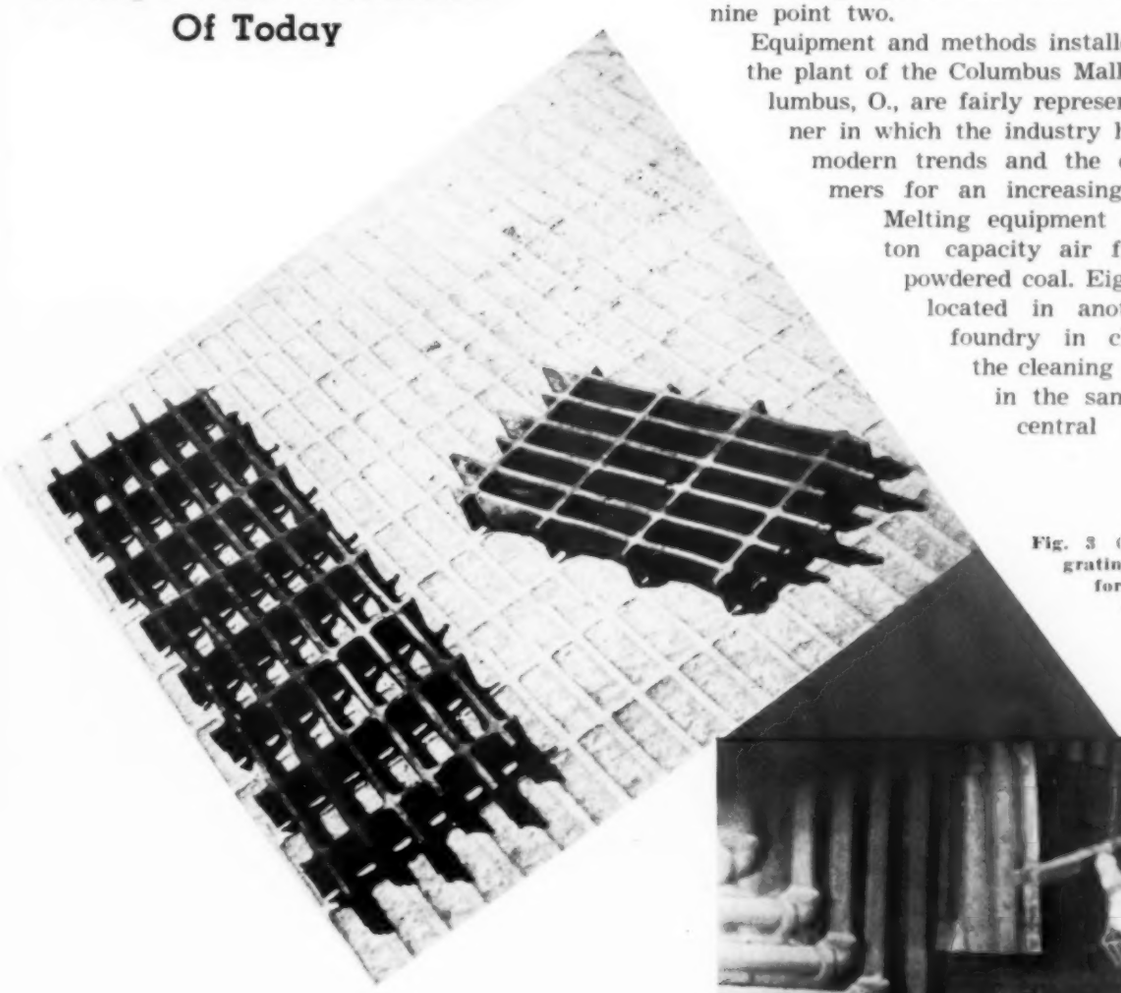
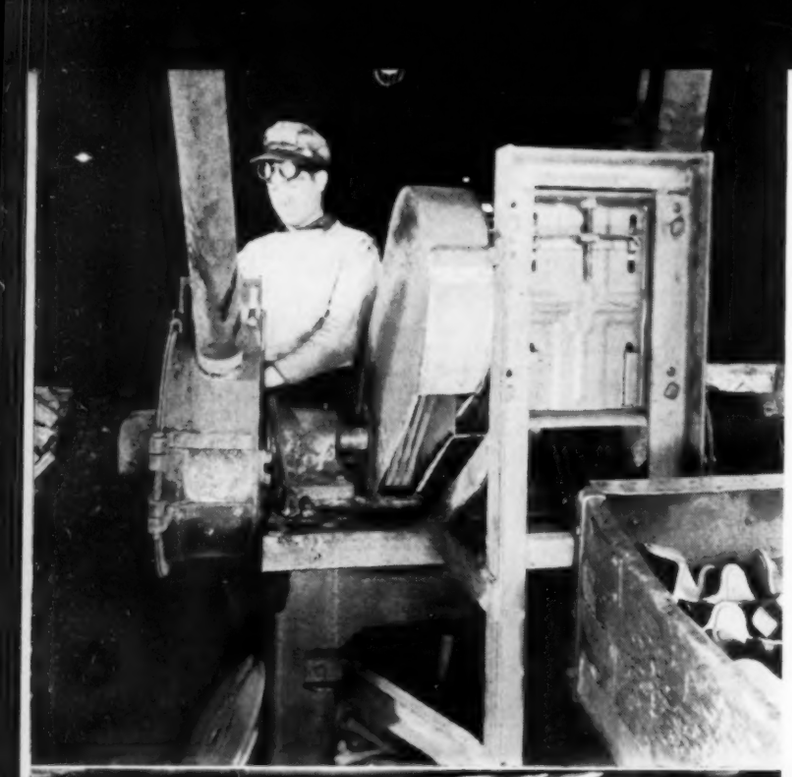


Fig. 3 (Left)—Malleable iron gratings set in concrete form gangway floors. Fig. 4 (Below)—Core setting in mold for elbows

size, weight, surface appearance, strength and dimensions have been reduced to microscopic proportion. Minor and superficial defects in no way affecting the utility of the casting and which a few years ago would not elicit any comment, now are viewed by the inspector with horrified alarm and stern disapproval. What is more to the point so far as the foundry is concerned, the offending casting scornfully is plucked from the line and thrown on the scrap pile.

To keep this scrap pile within reasonable bounds the modern foundryman has improved his molding and melting practice and is just as particular in his selection of raw materials as the manufacturer of any high class product. The old hit or miss, rule of thumb methods no longer apply. Industry constantly is moving forward and the foundry is well up in the front of the procession. Comparison of the new and the old technique is somewhat analogous to that of



distribution station. Obviously melting and annealing conditions can be controlled closely and in accordance with scientific principles where the fuel is supplied through a scientifically designed and flexible system. Main pipe lines carry the coal from the central supply tank to the various furnaces and ovens where it is discharged into individual hoppers for each unit. These individual hoppers supply the fuel to their respective burners.

Air for combustion is supplied by a fan with accurate adjustment by means of an air gate. Powdered coal is fed from the hoppers by a screw feeder regulated by a variable speed transmission. This combination provides proper adjustment of volume and mixture of fuel.

In this coal handling system designed and installed by the Whiting Corp., Harvey, Ill., coal from incoming railroad cars is discharged into a chute with a lift gate at the bottom which enables the unloader bucket to be filled. The bucket is raised on an inclined track and the contents dumped upon a belt conveyor which carries the coal over a magnetic pulley and discharges into the raw coal storage hopper. The magnetic pulley removes any scrap or tramp iron that accidentally may be present.

Coal Is Fed Automatically

The modern kiln dry system is employed for drying the coal. From the raw coal storage hopper the coal is fed automatically to the pulverizer where the drying takes place. This is accomplished by introducing hot furnace gases from a hand fired furnace directly into the pulverizer system where the particles of coal are dried and pulverized while passing to the powdered coal storage hopper. What may be regarded as a byproduct of the system is a quantity of coal dust removed from time to time and mixed with the facing sand employed in the molds to produce a smooth skin on the castings.

Facing sand is prepared in a muller type mixer made by the National Engineering Co., Chicago. The loading arrangement is different from that usually employed. The materials for a batch are dumped in a box below the floor level at the back of the mixer and then lifted by a bucket elevator and loaded into the pan as shown in Fig. 8.

After the castings have been shaken out and removed, the sand on the various molding floors is cut over by a machine made by the American Foundry Equipment Co., Mishawaka, Ind. Close supervision is exercised over both facing and molding sand and definite standards have been established for sand destined to be used on various classes of castings. The foundry is engaged in the production of a general line of miscellaneous castings ranging in weight from an ounce or two, up to 100 pounds. Although the castings vary to a wide extent in size, shape, thickness and weight, they (*Please turn to page* 70)

Fig. 5 (Top left)—Snagging hard iron castings on individually driven grinding stands. Exhaust ducts carry away all dust and grindings. Fig. 6 (Center)—Annealing pots are made in the floor. Fig. 7 (Left)—A view of the core room showing the wide variety of cores that are produced

Cleveland Promises Many Treats

ENTHUSIASTIC committees of the Northeastern Ohio Chapter of the A. F. A. are arranging special features for the annual convention and exhibition of the American Foundrymen's association to be held in Cleveland, May 14 to 19. Plans under way include programs of plant visitation, ladies entertainment, Northeastern Ohio day, the annual dinner of the association, golf and the annual stag party.

The annual stag party, to be held Tuesday evening, May 17, will surpass in every respect any event yet staged at an annual convention. Arrangements for the event are under a joint committee of the Northeastern Ohio chapter and the Foundry Equipment Manufacturers' association, with L. P. Robinson, Werner G. Smith Co. as chairman and Arthur J. Tuscany, Foundry Equipment Manufacturers' association, as vice chairman. These men are being assisted by a group of representative foundrymen and equipment and supply men.

Elaborate Program in Preparation

The stag party will be held in Music hall, Public auditorium, Cleveland, and will be followed by refreshments and a complete buffet supper. The committee announce that only tickets up to the capacity of the hall will be sold. This will insure everyone attending a comfortable seat in a beautiful and modern theater.

The Northeastern Ohio chapter has an outstanding and enviable reputation for the quality of entertainments they have produced in the past. The Christmas party of the chapter, which for some years has been directed by Mr. Robinson, is recognized as an outstanding event and one of unusually high quality. With the additional facilities available in the Music hall, particular effort is being made to make the stag party the finest entertainment feature which has ever been presented to the foundry convention group, and one which will be definitely designated by its quality for a long time to come.

The committee has set up headquarters at Suite 632, 1213 West Third street, Cleveland, and tickets at $3.00 each can be purchased from the Stag Party committee at the above address or from the American Foundrymen's association. Those desiring tickets are requested to send reservations with check to cover the number of tickets desired, bearing in mind that when the available number of seats are sold no further ticket orders will be accepted.

Interest in the exhibition of foundry equipment and supplies promises one of the finest and most instructive shows in recent years. According to C. E. Hoyt, executive vice president of the association and manager of exhibits, 200 firms already have reserved space in the large and well equipped underground exhibition hall and this total will be increased as the time for the opening of the exhibition approaches.

Beginning with the opening session at 9:30 A.M. Monday, May 16, the 42nd annual convention of the American Foundrymen's association will present one of the most complete and comprehensive series of management, technical and shop practice sessions in its history. The program calls for 31 sessions, with papers and committee reports covering all branches of the industry and with material of interest and value to the executive, metallurgist, mechanical engineer, shop executive, foreman and worker.

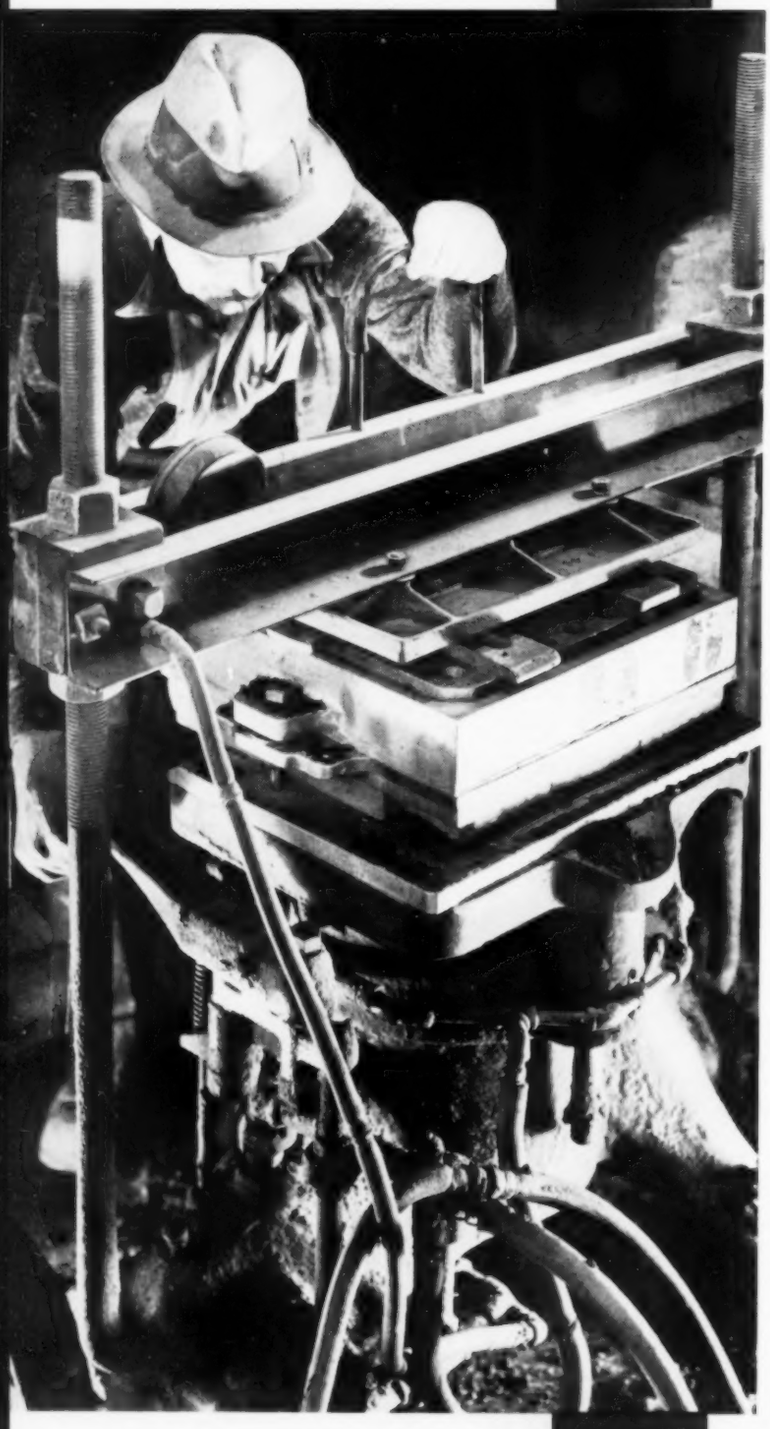
Sessions Concentrated on Different Days

The program this year has been arranged to concentrate the sessions for any one branch of the industry during two days of the meeting with gray iron and nonferrous sessions on Monday and Tuesday, steel on Tuesday and Wednesday and malleable on Wednesday and Thursday, while the management and general interest sessions are scattered throughout the week.

Following the precedent set at the 1937 convention, the program this year has been organized to provide meetings of peculiar interest to executives. Sessions listed under this heading are those covering melting cost methods, foreman and apprentice training, safety and hygiene and job evaluation. The subject of melting costs will be covered as follows: "Steel Melting Costs," by W. J. Corbett, Atlas Steel Foundry Co., Buffalo; "Malleable Melting Costs," by (*Please turn to page* 85)

MOLDING

By H. J. ROWE
Aluminum Co. of America,
Cleveland



MAKING of sand castings of any of the commercial metals generally is classified as an art and hence to some measure is to be acquired through experience. When the casting art was confined to but a few metals, as was the case not so many years ago, acquiring such experience was not difficult. Today, with the great variety of casting alloys in use and the higher standards that must be maintained, the making of castings has become more specialized.

Therefore, a molder of iron castings not only must have acquired a knowledge of the molding art through experience, but also must be familiar with the characteristics of the various iron alloys in order to adjust his molding practice to the peculiarities of the iron used. Similarly, the making of aluminum alloy castings requires a knowledge of the particular foundry characteristics of these alloys so the most suitable molding practice can be employed.

Molding Involves Skill and Experience

Founding of aluminum alloys is not difficult when the characteristics of the metal are understood. Certain of these characteristics are inherent in aluminum itself while others are the result of alloying additions and therefore, peculiar to specific alloys. Some make for ease in molding while others require the exercise of particular care. A knowledge of these different characteristics and means for their control is essential to the successful molding of aluminum alloy castings.

One of the most significant characteristics of aluminum alloys which influences the molding practice, is low specific gravity. Aluminum alloys weigh approximately one-third as much as brass, cast iron, or steel. This characteristic is of distinct advantage in that it makes for lower mold pressures and permits lighter sand ramming. Mold equipment also can be considerably lighter than that which is necessary for the heavier metals, thus facilitating handling. Small and medium size casting molds usually can be poured without using weights and it is often unnecessary even to place boxes or frames on such molds made in snap flasks.

The light weight of aluminum is not, however, with-

Fig. 1—Squeezing a drag mold on a jolt-squeezer molding machine

In The Aluminum Foundry

out some disadvantage, since it makes it more difficult for aluminum alloys to rid themselves of oxide or to drive off mold gases as readily as the heavier metals. A molding practice which insures delivery of metal to the mold cavity with a minimum of oxide is therefore essential. Permeability of the mold also assumes greater significance in order to insure ready displacement of the air and water vapor by the metal as it enters the mold cavity. Adequate control of these factors is not difficult if they are recognized during molding.

A second characteristic of aluminum alloys which demands consideration during molding is their hot shortness. At temperatures just below that at which the metal solidifies, the strength of aluminum alloys is quite low. Any abnormal resistance to contraction while a casting is passing through this temperature range may result in cracks.

Some Alloys Crack More Easily

This characteristic varies materially with the alloy, some being more prone to hot short cracking than others. The aluminum-silicon alloys are much less susceptible to such cracking than the aluminum-copper alloys, particularly those alloys containing less than 5 per cent copper. Choice of alloy, as well as care in molding to insure minimum resistance to contraction, is effective in overcoming casting cracks from this cause.

The third characteristic of aluminum which has an important bearing on the molding practice is its relatively high solidification shrinkage. Such shrinkage takes place rather quickly as the metal changes from the liquid to solid state. Unless compensation for this reduction in metal volume is made, it may result in one or more of such common defects as draws, surface shrinkage, porosity, or shrinkage cracks.

Again the amount of solidification shrinkage as well as the rate at which it occurs, varies with the particular alloy. Generally speaking, those alloys which solidify over the largest temperature range exhibit the greatest shrinkage. Therefore, the aluminum-copper alloys require more attention to molding to eliminate the effects of such shrinkage, than the aluminum-silicon alloys.

Before taking up the various molding practices which provide the most favorable conditions for aluminum alloys, it would be well to discuss casting design briefly. There are several points in connection with the design of patterns for aluminum alloy parts, which if considered during construction, will aid materially in the production of sound castings. Although most of these are of more or less importance in patterns for use with any metal, they have a specific bearing on aluminum.

(1) Avoidance of abrupt changes in the section thickness of castings will reduce materially the tendency for shrinks and cracks. Thin sections preferably should taper gradually to the point of junction with a heavier section. Avoid heavy sections when a light sec-

Fig. 2—Finishing a green sand cope before closing the mold

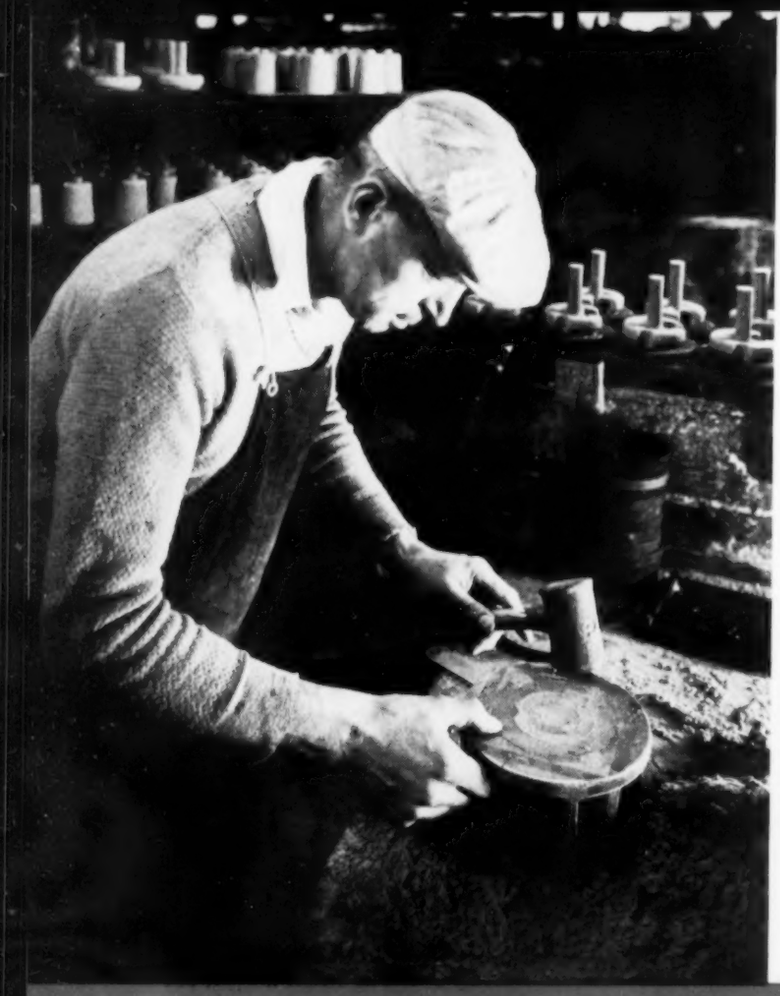


Fig. 2—Cast aluminum dump core boxes with steel wear strips withstand severe core room service

tion reinforced with ribs of equivalent thickness can be used satisfactorily. Generous, but not excessively large fillets, should be provided at all angles.

(2) Castings with thin ribs and fins should be designed with care. Rapid cooling of such sections may set up stresses within the casting which may be sufficient to cause cracks. Whenever possible, ribs or fins should be molded with the ribs projecting into the lower part of the mold, that is, in the drag. This will facilitate the filling out of the mold cavity as well as reduce the danger of dross and gas accumulating at the extreme edges of the ribs.

(3) Machined surfaces are preferably cast in the drag since there is less chance of these surfaces containing shrinkage or dross. When conditions require the casting of such surfaces in the cope, additional finish allowance should be provided to permit machining down to sound metal.

(4) Core prints should be of sufficient size, not only to support the core satisfactorily, but to permit easy escape of core gases. Complete venting should be provided. These requirements are particularly important in the case of cores completely surrounded by metal.

(5) Use of chaplets or inserts is not a preferred practice for castings which are required to be pressure tight. Aluminum alloys seldom bond satisfactorily to such inserts, hence, leaks usually result. It is preferable to use core prints and plug the cored holes with threaded inserts when pressure tightness is required. Sufficient metal should be provided around any cast-in insert to eliminate cracking when the aluminum solidifies.

(6) Gated patterns, match plates, or cope and drag equipment should be studied carefully before the gating is fixed for production. Excessive scrap losses can be avoided by checking a few castings made with temporary or cut gates before such gates are permanently applied.

(7) Although pattern equipment suitable for aluminum alloy castings is not unlike that used for other metals, equipment designed for other metals is not always suited for aluminum. Aside from difference in shrinkage allowance and strength of the various metals, factors which should be considered when adapting such patterns for aluminum, molding conditions may also dictate changes in design or gating. The extent of such changes depends upon the requirements of the particular casting and the characteristics of the alloy to be used.

General molding methods employed for other metals are quite suitable for aluminum alloys. Methods for handling and conditioning sand, practices of core making and molding are quite similar regardless of the metal used. However, the properties of aluminum alloys establish certain preferred molding practices which differ somewhat from those best suited to other metals. Several of the most important controls which are favored for aluminum alloys are discussed below.

Aside from the effect on the surface appearance of

the castings produced by the sand used for molding, proper selection and control of sand are of importance in relation to certain of the inherent foundry characteristics of the metal. Although the ideal sand cannot be realized fully because of the great mobility and sand-searching power of aluminum, there are a number of natural sands which meet the normal requirements.

For green sand molds, a clay bonded sand essentially free from organic materials and falling within the A.F.A. classification 1*G* to 2*G* is quite satisfactory; the finer sand for small bench work and the coarser sand for floor work. Sands of this type, tempered with 6 to 8 per cent water and rammed lightly, impart a very desirable surface to the castings and are open enough to permit ready escape of the mold gases. Facing of green sand molds is unnecessary if the proper molding sand is available, conditioned and rammed properly.

A silica sand with a fineness of from 70 to 90 is satisfactory for most dry sand cores although a finer sand may be desired to impart further smoothness to certain cores. When these finer sands are not commercially available, the addition of controlled amounts of either a finer silica sand, or in some cases, molding sand, to the coarser material may be found useful for this purpose.

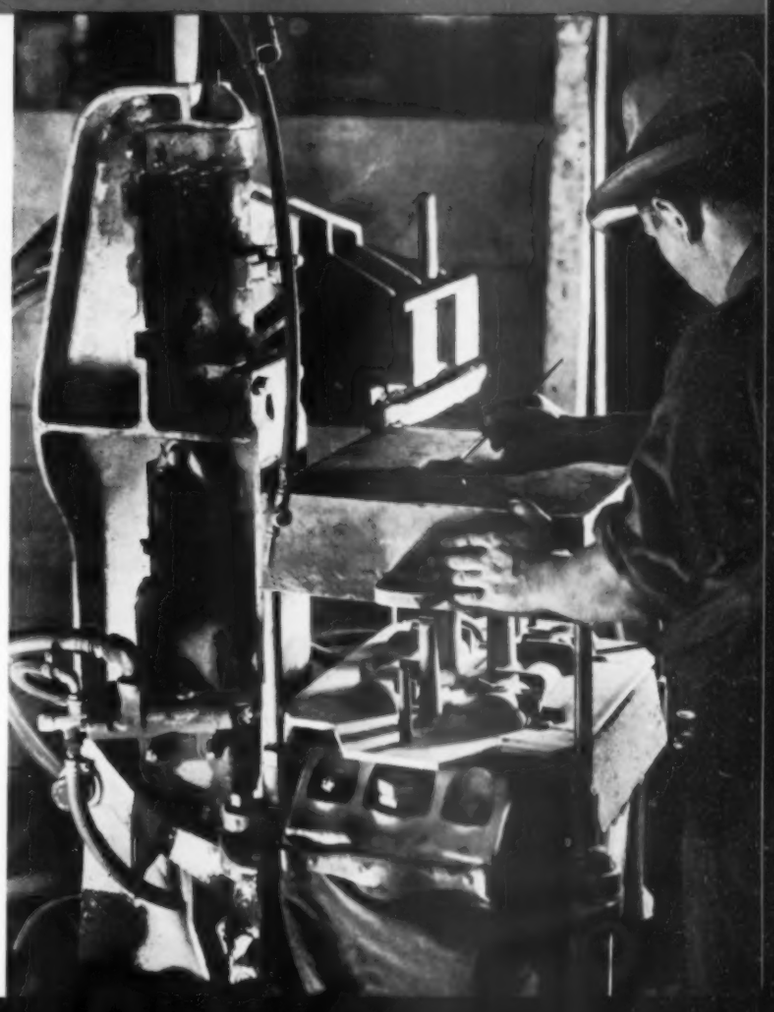
A core wash of either the talc or graphite type may also be used to improve the surface further. Core sands require the use of an artificial bonding material, and many of the standard core binders equally are suited for this purpose. The selection of the proper binder and the core mixture is dependent upon the use to which the core is put. Binders which give off a minimum of gas are preferable for aluminum alloy cores.

Apart from the original character of the sand used for molds and cores, the control exercised in their handling is important. Low specific gravity of aluminum alloys makes maximum permeability necessary. Light uniform ramming and a minimum moisture content will insure maximum permeability of the green sand mold. Venting of cores to the outside of the mold will improve their natural permeability greatly. Localized areas of low permeability are often the cause of surface blows, shrinkage and porosity in the final casting.

Hot shortness of aluminum alloys dictates certain requirements with respect to the strength of cores. Body and housing cores must be soft enough to be crushed easily by the casting as it solidifies and contracts. Choice of binder and mix control this characteristic and a knowledge of their effect on core strengths will reduce hot short cracks greatly.

Gating of aluminum alloy castings is a part of the molding art which, to a great extent, must be acquired by experience. Certain fundamental considerations and a knowledge of alloy characteristics serve as a guide, but the application of these to each particular casting is generally a matter of experience. Both the hot shortness and high solidification characteristics of aluminum alloys are affected (*Please turn to page* 74)

Fig. 4 (Left)—Drawing cope pattern from green sand mold made on a jolt-rollover molding machine. Fig. 5 (Below)—Finishing a cope mold after the pattern draw on a squeezer machine



What Is Dry Sand Strength?

By N. J. DUNBECK
Eastern Clay Products Inc.,
Eifort, O.

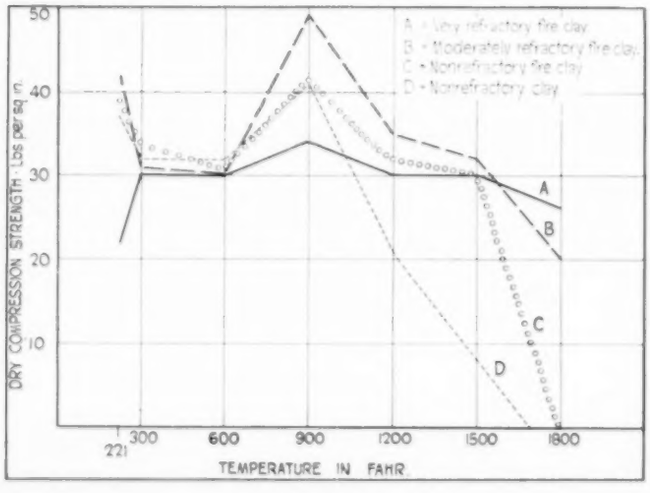
THE term dry strength of molding sand is used loosely at present, with the result that comparison of strengths from foundry to foundry frequently gives misinformation instead of information. Actual knowledge of the property and its effect upon casting results is too slight to justify the sometimes positive and broad statements made concerning it.

We need much more information on this subject and this information will come from a comprehensive study of the problem now underway by the sand research committee of the American Foundrymen's association. Meantime, we need to clarify our thinking. The writer hopes that we may adopt a somewhat more precise method of describing any particular phase of dry sand strength with which we are individually concerned.

Confusion in the use and interpretation of the term arises from the fact that many foundrymen do not keep in mind the rather startling changes which take place in the dry sand strength of any one sand at different temperatures. The accompanying chart shows the dry strengths at various temperatures of four simple synthetic sands composed only of silica sand and bond.

Dry strength varies with temperature, but the amount of variation and the point at which strength varies depends upon the kind of bond used. If auxiliary binders, cereal, pitch or rosin, had been added to these sands, the results would show far wider variation. Some of these binders would just become effective at temperatures at which others were burning out. Keeping in mind these variations, consider the ways in which the term dry strength is used.

Dry compression strength of four types of sand varies widely according to temperatures between 221 and 1800 degrees Fahr.



The A. F. A. standard dry strength test is made by breaking a rammed sample of sand which has been baked at 221 degrees Fahr. for one hour or until dry. Most foundrymen who use sand testing equipment are referring to dry strength at that temperature when they use the term in a general way. This also is the meaning usually implied when the term is used in technical papers or discussions. The foundryman who states that he is getting a cut or wash because his dry strength is too low is not thinking of dry strength at 221 degrees Fahr., but is referring to a deficiency in dry strength at actual pouring temperatures. The chart shows that this high temperature dry strength may differ radically from the dry strength at 221 degrees Fahr.

Co-relate Tests with Results

The standard test has value as a control test when a foundry uses one natural sand, one bond or one fixed combination of materials. If sand washes at a dry strength (221 degrees Fahr.) of 25 pounds compression and the wash is eliminated at 35 pounds, obviously the proper course is to maintain a dry strength (221 degrees Fahr.) of 35 pounds. The dry strength test at 221 degrees Fahr., as such, did not give the needed information until the test was correlated with actual casting results. Then the test is an indication of the dry strength at the unknown temperatures set up by the metal on the mold face. However, this indicator is dependable only so long as exactly the same materials are used. If materials or combinations of materials are changed, the 35 pounds dry strength no longer assures good results because the changed bonding material or combination may have a considerably different dry strength than did the original mix at pouring temperatures. The procedure then is to test the sand at high temperatures or to make sample castings. Eventually a dry strength at 221 degrees (*Please turn to page* 80)

Melting Nonferrous Alloys

In Pit Furnaces Requires Close Attention to Details To Insure Rapid and Complete Combustion And Minimum of Gas Absorption

By N. K. B. PATCH

PRIMARY objectives in melting metal in the nonferrous foundries are as follows:

First—To melt metal and increase its temperature so that it will flow readily to all parts of the mold cavity when poured.

Second—To combine elements of the alloy so that they are mixed thoroughly and are distributed uniformly throughout the mass.

Third—Where metals to be melted are dirty, as in the case of borings and turnings, the melting process also must include elimination of dirt, grease, etc. that otherwise would be carried into the mold cavity.

Melting must be done at a minimum cost for fuel, furnace upkeep and labor, and for metal vaporized or lost through oxidation during the melting process.

General principles of melting in the brass foundry demand specific practices for each and every type of furnace and type of alloy or metal to be melted. One that applies to all methods of melting is to subject metal to the melting process for the shortest possible time. In other words, melting must take place at the maximum speed. There are several reasons why this is a cardinal principle.

First to secure maximum speed from any of the common types of furnaces in use in the foundry, combustion of the fuel must be as efficient as possible so as to produce maximum heat from the fuel supplied. In so doing all gases are oxidized or burnt completely, thus avoiding the presence of underburnt gases, which are soluble in the metals.

Second, the longer nonferrous metals are subjected to the furnace atmosphere the more likely they are to be contaminated by such underburnt gases as are present since under the best combustion conditions some underburnt gases may be present in some part of the combustion zones within the furnace. Third, oxidation of the metals also may take place during melting resulting in a loss that is undesirable.

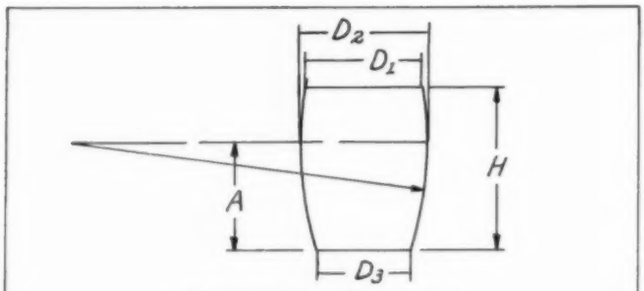
Several general types of furnaces are commonly in use in the nonferrous foundry and each finds particular favor with certain foundrymen. The first and oldest type is the pit furnace, in which coke or coal is used for fuel and a crucible is set on a fuel bed and surrounded with burning fuel. This type of furnace is operated in two ways, one with natural draft and the other under forced draft.

Crucibles Remain in Furnace

Some of these furnaces are so constructed that the crucibles remain in them and the entire furnace is tilted to permit pouring off the charge of metal. The crucible remains in the furnace and retains some of its temperature in anticipation of the next charge. This tilting type of furnace is not much used so it will not be discussed further.

The stationary, or common type of pit furnace should be designed so as to permit a free flow of air through the furnace to produce the maximum efficiency in fuel combustion. Grates should be designed so that there is nothing to impede the flow of air up through the fire around the central point where the crucible will stand.

A common error in this type of furnace is to expect air to enter at the center and spread around the crucible as it rises. That results in excessive combustion of fuel under the crucible, and lets the crucible sag down until it gets too close to the grate. Consequently, the



Dimensions in Inches

Size No	H	A	D_1	D_2	D_3	Size No.	H	A	D_1	D_2	D_3
10	8 1/16	5 1/4	6 1/16	6 3/16	4 7/16	70	15 1/16	9 13/16	11 1/4	12 3/16	8 5/16
12	8 1/2	5 1/2	6 3/8	6 7/8	5 1/16	80	15 5/8	10 1/8	11 5/16	12 5/16	9 1/4
14	8 7/8	5 3/4	6 11/16	7 3/16	5 1/4	90	16 3/16	10 1/2	12 1/8	13 1/8	9 5/16
16	9 1/4	6	6 15/16	7 1/2	5 1/2	100	16 11/16	10 7/8	12 1/2	13 1/2	9 7/8
18	9 13/16	6 3/8	7 5/16	7 15/16	5 13/16	125	17 3/8	11 5/16	13	14 1/16	10 5/16
20	10 5/16	6 11/16	7 11/16	8 3/8	6 1/8	150	18 3/8	11 5/16	13 3/4	14 7/8	10 7/8
25	10 15/16	7 1/8	8 3/16	8 7/8	6 1/2	175	19 1/4	12 1/2	14 3/8	15 5/16	11 3/8
30	11 1/2	7 1/2	8 5/8	9 5/16	6 13/16	200	20	13	15	16 1/4	11 7/8
35	12	7 13/16	9	9 3/4	7 1/8	225	20 3/4	13 1/2	15 1/2	16 13/16	12 5/16
40	12 1/2	8 1/8	9 3/8	10 1/8	7 3/16	250	21 1/8	13 7/8	16	17 5/16	12 7/16
45	13 3/16	8 5/16	9 7/8	10 11/16	7 13/16	275	22	14 5/16	16 5/16	17 5/16	13
50	13 3/4	8 15/16	10 1/4	11 1/8	8 1/8	300	22 1/2	14 3/8	16 7/8	18 1/4	13 3/8
60	14 7/16	9 3/8	10 15/16	11 7/16	8 5/16	400	24 5/16	15 13/16	18 3/16	19 5/16	14 7/16

Fig. 1—Standard dimensions of plumbago crucibles for non-tilting furnaces in nonferrous foundries

crucible is chilled by the entering supply of air, and the melting process is retarded.

A good practice is to set a firebrick block in the center of the furnace upon which the crucible may stand. The block should be of sufficient height to permit a satisfactory bed of fire under the crucible. The depth of fire, of course, is somewhat different for the varying amounts of metals to be melted, but in general, a depth of 8 inches of fire over the grate should be a minimum. As the size of the crucible and consequent size of charge to be melted is increased, the depth should be increased until for a crucible of say No. 250 or 300 a depth of 12 inches would be used.

Obviously, a competent furnace tender could do a fairly good job even if the furnace was of such a size as to make it impossible to accommodate as deep a bed as described. This means, that the furnace tender must keep the fire well packed down under the crucible and must keep the grate clean of its accumulation of ash. The crucible should stand in the furnace so that its top edge or lip is approximately at a level with the bottom of the flue from the furnace to the chimney.

It will be seen from this description that the size of the crucible to be used in the furnace influences the size of the furnace. Consequently if the type of castings manufactured require small heats, it will be desirable to have the furnace small so that the crucible will stand in the proper position in the furnace. There should be ample space around the crucible for a good fuel bed but an excessively thick wall of fire around the crucible may waste fuel.

However, one cannot have the exact size of furnace for each size of crucible and, therefore, the exact thickness of fire wall around the crucible cannot be laid down. Where a large crucible, such as No. 250 or No. 300, is being used, a good heavy wall of fire is desirable and the furnace should be of such a diameter as to permit of surrounding the crucible with 7 to 9 inches of burning coke or coal.

As the size of the crucible and consequent size of charge varies, theoretically, so should the thickness of fire surrounding the crucible. For example, a No. 60 crucible would work best in a furnace with a 3 to 5 inch wall of fire surrounding its bilge. A No. 80 would likewise require approximately the same size wall of fire. Also No. 100 or No. 150 will work well with a wall of fire about 7 inches. A No. 200 up to No. 300 should have 7 or 9 inches of fire surrounding it to give maximum speed of melting.

It will be seen from this that by measuring the size of crucible used and making due allowance for the wall of fire on either side of the crucible, the ideal diameter for a furnace for a given crucible may be estimated easily. However, the depth of the furnace likewise should change with the size of the crucible so as to insure a proper depth of fire below the crucible and the proper position of the crucible with respect to the flue or outlet of the furnace.

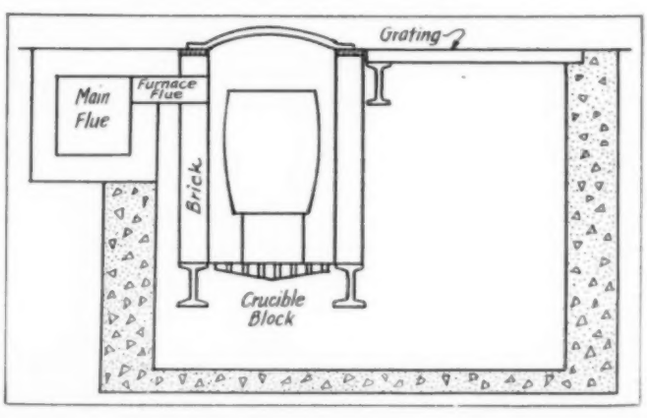
Standard Dimensions of Crucibles

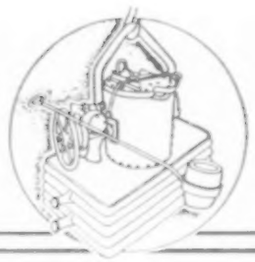
Crucible dimensions not only change in diameter for increase in capacity, but likewise change in height and, therefore, will influence the size of furnace both in diameter and height as the furnace dimensions are changed to accommodate a change in the size of the crucible. Standard dimensions of crucibles are given in *Fig.* 1 and are those adopted by the American Engineering Standards committee, the American Foundrymen's association and the Plumbago Crucible association.

Fig. 2 is a schematic representation of the cross section of a pit furnace. No dimensions are included due to the fact that they would vary considerably. For example, the main flue size would depend upon the number of furnace flues attached to it, and its capacity must accommodate all of them. Depth, length and width of the pit will depend on crucible size, number of furnaces, and amount of ash from the fuel.

Grate indicated is preferably cast iron in the form of a ring with cross bars spaced to accommodate the size of fuel. The grate should be smaller in diameter than the furnace to permit entrance of air close to the lining. The grate may be sus- (*Please turn to page* 82)

Fig. 2—Schematic diagram of the usual pit type furnace





Cracks Develop In Anvil Block

FOUNDRYMEN, probably to a greater extent than any other class of men engaged in the mechanical arts, place little credence in the old saying "There is nothing new under the sun". Even veterans of 40 or 50 years, who presumably should have seen practically everything, occasionally encounter a situation or problem entirely outside any former experience. An instance of this kind turned up recently where cracks developed in the dovetail roots of a 100-ton anvil block for a drop forge hammer.

The casting was supplied about 3 years ago by an old, reliable firm which has specialized for many years in the production of heavy castings. The hammer is a 7-ton drop forge and the service is extremely severe in stamping from the solid the end frame that carries all the cylinders of a modern aero engine. The material is of the high silicon alloy type, which unlike steel has little flow. The drop is almost as severe as dropping block on block.

Cracks Developed in Center

A crack about 6 inches deep developed in the center of the root of each dovetail. As shown in the accompanying illustration, the peculiarity of these cracks is that they started in the center of the bearing dovetail. There is no sign of a crack at the ends where, if any place, one might expect a crack to appear. A second block after three month's service is developing the same form of defect. It has a hair crack for about 2 feet in the center of the root of each side of the dovetail.

Had it only been on one side where the heavy key is driven in, one might suspect a reason, but even so, why should the crack appear in the center and not at the ends? There never has been any trouble with other blocks which had the plain face poppet fastenings. Therefore it would seem that for these heavy hammers the dovetail fastening is a source of weakness. Physical properties and analysis of the iron are up to standard as determined by three independent laboratories. Analysis shows: Total carbon 3.05 per cent; silicon 1.49 per cent; manganese 0.79 per cent; sulphur 0.046 per cent; phosphorus 0.36 per cent; chromium 0.05 per cent; nickel 0.15 per cent.

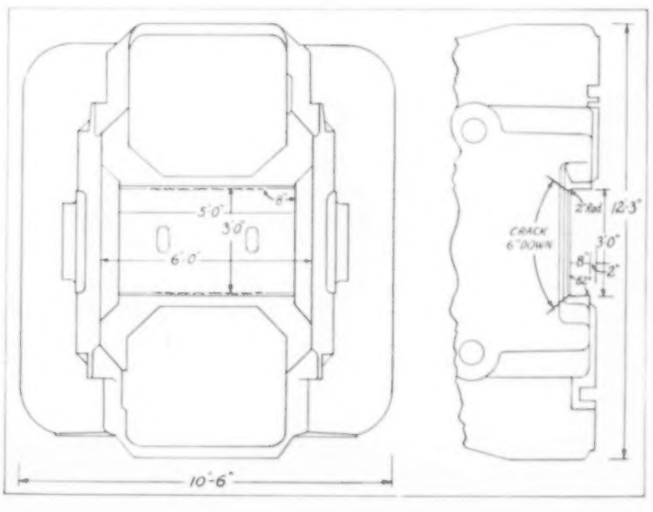
An article which appeared in the July, 1937 issue of THE FOUNDRY showed a 30-ton block provided with a double seated dovetail to receive the loose bottom tool. Apparently the designer decided that a double dovetail not only would be stronger, but would more efficiently distribute the vibrations of the heavy impact blows.

Obviously a steel casting would be more satisfactory, but unfortunately in this instance owing to certain commitments for other work, delivery could not be had for 12 months. In the meantime demand was insistent for the production of the two hammers. The problem is not one of price or responsibility, but simply to keep up production. As a result decision was arrived at to cast a block of the following analysis: Total carbon 3.00 per cent; silicon 1.00 per cent; nickel 1.00 per cent; molybdenum 0.50 per cent. The dovetail feature also is to be modified.

Directs Attention to Ratio

Commenting on the foregoing a prominent manufacturer of hammers directs attention to the ratio between hammer blow and anvil weight. Assuming that the 7-ton drop forging hammer is of the manufacturing type — shape of the anvil in the illustration and accompanying remarks bear out this inference — the minimum ratio between falling weight and anvil weight should not be less than 1 to 20, nor more than 1 to 25. In the figures given, a 7-ton hammer and 100-ton block (*Please turn to page* 80)

Dotted lines show location of cracks at bottom of dovetail on both sides



QUESTIONS and ANSWERS

Chilling Is Not Practiced in Producing Steel Castings

Please advise your experience with chilling steel castings such as plow points, wheels and crusher jaws.

Chills, internal and external are used in the steel foundry but their sole object is to accelerate the cooling speed of the metal in the vicinity. They do not affect the composition or the structure. Where gray cast iron is poured against a chill, the carbon in the iron remains in the combined form in the area directly in contact with the chiller. Thickness or depth of material affected depends on several factors, including temperature of metal, composition, thickness of casting section, and thickness of chiller. These factors do not affect cast steel or change any of the physical properties.

Cast iron contains approximately 3.50 per cent carbon, partly in the combined and partly in the free or graphitic form. Relative hardness of the casting is determined by the amount of combined carbon in proportion to the amount of graphitic carbon. In steel castings the average carbon content is 0.25 per cent and it is all in the combined form. It remains in this form irrespective of whether the metal is poured hot or cold, or whether it is poured into a sand or a chill mold. The only way to secure hard steel castings is to charge suitable material in the furnace, or subject the castings to elaborate heat treatment.

Attention To Details Prevents Burning in of Cores

We are making bearing bronze of the following approximate analysis: Copper, 79 to 82 per cent; tin, 5 to 7 per cent; lead, 12 to 15 per cent; and zinc, 1 to 2 per cent. Cores are made of silica sand of medium size structure and bonded with oil. A core wash having a red soap stone base is used. However, we have used other core washes including plumbago. When the metal section in the bushings reaches 1-inch and above, we are troubled with extreme burning in of the cores. We have poured the metal at 1900, 2000 and 2100 degrees Fahr. with the same results. We would appreciate your comment with regard to sand mixture of cores, and suitable core wash to relieve that situation.

You have failed to tell the amount of core oil used and the ratio of oil to sand is a vital factor. Proportion of oil should be the absolute minimum that will give sufficient bond to make the cores strong enough to be handled and to withstand the pressures under which they must serve. Are the sand particles of a uniform size, or is the sand a mixture of several sizes the maximum of which is that which you describe? If free venting is important, a uniform size sand is much to be preferred so that the finer sand will not be present to fill up the voids between the particles of the coarser sand.

If, however, free venting is not imperative, then finer particles may be present, and if the core bonding material, in your case oil, is well mixed with the sand, the presence of finer particles will help to bond the entire mixture together and consequently will result in a sufficiently strong core with even less core oil present than if the sand were of uniform size particles.

Where a small amount of core binder is used, it should be well distributed and to do this best, it is well to have the core binder carried throughout the sand by having the binder mixed with some water and then have the entire mixture, sand, binder and water thoroughly mixed, preferably by a mechanical mixer. When the binder has been well distributed throughout the sand, cores made from it dried rather rapidly will tend to have the binder concentrated where the water is evaporated, namely at the surface of the cores.

The inner part of the core will have less binder due to the concentration of the binder at the surface. If, however, slow baking is resorted to so that the water does not evaporate rapidly, the core binder will be distributed more uniformly throughout the core and a more uniform strength will be noticed throughout its section. About 35 to 40 parts of sand and 1 of oil should give an ample strength core for the ordinary size bushings unless the cores are very long, in which case the cores should be well rodded to give ample strength to resist any bending of the core.

We believe that if you make these cores with a minimum amount of bond and bake them correctly, at about 400 to 425 degrees Fahr., and then surface the core with a good plumbago wash, which is well dried before the core is used, your trouble should be materially reduced. If, however, it still persists because of a heavy section of metal around the core

or because of heavy pressure due to large risers, the cores might be rubbed with a paste made of a mixture of plumbago and mineral oil and then dried. Care should be taken that this paste is rubbed into the surface of the core and the excess wiped off. Obviously a minimum of such material should be used, and it should be applied to the core only a short time before the core is to be used as the mineral oil might react with the bond to make the surface of the core wash away or erode under the action of the inflowing metal into the mold.

The surface must be relatively tight and free from those materials which are combustible so that the hot metal cannot burn them away and replace them with metal and cause the burning in effect you describe. Plumbago is not combustible at the temperature of molten bronze, and therefore, plumbago should give you protection. The problem is to have the plumbago remain in position and resist these forces. That makes it a question as to what bond to use with which to attach the plumbago protection. We believe that the answer is to make the cores so that they require the minimum amount of protection and then coat them with plumbago which is bonded to the core with a material which will not burn freely and which requires a minimum amount of bonding material.

Iodine Number Is a Measure of Oil's Dry Film Property

In a recent article on cores and core oils we noted several references to iodine. Can you give us information on why and how the terms iodine value and iodine numbers are used? Is iodine used in testing core oils and if so what does it show?

Several tests are applied to core oil to determine certain characteristics, for example: Specific gravity, flash point, fire point, iodine number, saponification number, acid number, color, odor, etc. The iodine value is taken as a measure of the ability of the oil to oxidize with the formation of a dry film. Translated into ordinary foundry language, the iodine value represents the strength of the binder.

In *Chemistry of Engineering Materials*, Robert B. Leighou describes the iodine value as follows: The iodine value represents the percentage of iodine absorbed by the sample, i.e., the number of centigrams taken up by 1 gram of oil. The absorption is due mainly to direct addition, but may in part consist of substitution of iodine for hydrogen atoms. This value serves to show the proportion of unsaturated fatty acids present, both free and combined.

The direct addition of iodine depends upon the fact that in the unsaturated radicals which are those of oleic, linoleic and linolenic acids there exists a number of double bonds. For each double bonding 2 iodine atoms are absorbed. Then on this basis the oleic acid should absorb 2, the linoleic 4 and the linolenic 6 iodine atoms. Since these unsaturated compounds also react quite readily with oxygen, the iodine value is taken as a measure of the ability of an oil to oxidize with the formation of a dry film.

Aluminum Bronze Contaminates Turnings Which Are Melted

In melting down miscellaneous bronze turnings to ingots in an open flame furnace we sometimes encounter small quantities of aluminum bronze, the presence of which is not discovered until the first ingot is poured. Can you advise us how this metal can be treated or worked so as to eliminate the aluminum content?

Contamination of turnings by the presence of aluminum-containing alloys has been a problem for many years. If the aluminum is added to the metal in sufficient quanties to give trouble, it is almost impossible to remove it completely. The most common procedure is to scrap the heat in which the aluminum is present and sell it for junk to smelters who use it up in the production of certain classes of alloys in which aluminum is not objectionable. If there is only a small amount of aluminum present, it sometimes may be removed several different methods of oxidization.

One method of oxidizing the aluminum from the bath is to add copper oxide. Another method is to subject the heat to an extended melting period during which the atmosphere is maintained in a highly oxidizing condition by the presence of an ample supply of oxygen (or air). During the extended melting period, constant agitation of the metal is kept up by stirring or rabbling, as it is called. This oxidizing process, of course, does not only oxidize the aluminum, but it oxidizes the zinc, lead and tin, which are carried off in the slag; consequently, the metal loss is excessive.

From this you will see that to remove the aluminum after it has once been added to the bath of metal in which it should not be present is really quite a problem. That is the reason why the sorting of scrap and turnings is so carefully done today, since aluminum bronze is becoming more and more prevalent on account of its increased use. Some people, when they find a bath of metal does contain a small amount of aluminum, pour it into such small pieces that it can readily be broken up into very small units, and only a little of this used in any one heat of metal later on.

In that way the aluminum content in their regular production alloy is negligible. This is a doubtful procedure, however, and might lead to very serious trouble. Aluminum oxidizes more readily than the other elements in the usual brass foundry alloys and, therefore, where copper oxide or plenty of super-hot air is available to oxidize the metal, much of the aluminum may be oxidized. As above mentioned, however, the aluminum is removed from the metal at the expense of the loss of tin, lead, zinc, and sometimes copper.

If the castings into which the metal is to be poured are such that the presence of aluminum will give serious difficulty, the surest method of correcting the evil is to sell the contaminated ingot to the smelters for them to refine by the process which they have worked out and pour the castings from metal which does not contain the aluminum.

Structure Must Be Dense and Close

Will you please send us information on a suitable mixture for making cast iron molds for glass bottles?

Manufacture of molds for glass products is a highly specialized field, and as might be expected firms engaged in that work are rather reticent when it comes to discussing the details of mixtures employed for their products. For many years all glass molds were made of gray cast iron with a high carbon content, but in recent years numerous alloy irons have found application. Essentially, the molds must have a dense, close structure on the face which will have good machining characteristics and result in a nice smooth surface.

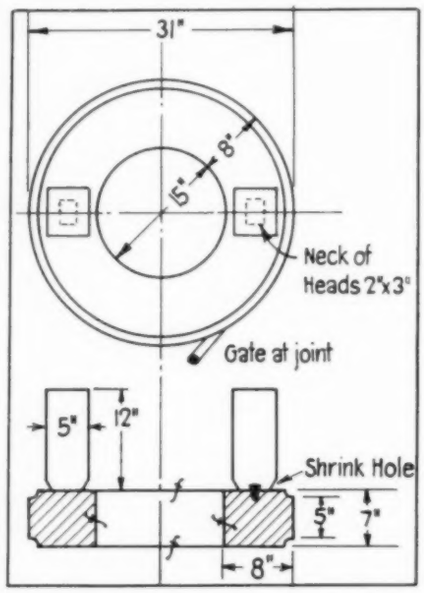
The dense, close structure generally was secured by casting against a chill. Usually a plain gray cast iron consisted of pig iron, return scrap, and machinery scrap. No steel was used. As mentioned previously, a number of alloy irons are being employed and they include such compositions as follows: Silicon, 2.15 per cent; manganese, 0.65 per cent; molybdenum, 0.35 per cent to 0.80 per cent; and total carbon, 3.60 per cent.

Silicon, 3.35 per cent; manganese, 0.25 per cent; nickel, 0.75 per cent; chromium, 2 per cent; aluminum, 2 per cent; and vanadium, 0.25 per cent. Silicon, 1.50 per cent; manganese, 0.60 per cent; nickel, 1.50 per cent; chromium, 0.60 per cent; and total carbon, 3.30 per cent. Silicon, 1.60 to 2.00 per cent; manganese, 0.50 to 0.60 per cent; nickel, 1.50 to 2.00 per cent, and total carbon, 2.80 to 3.00 per cent. Another which is being employed contains in addition to the usual elements of silicon, 2 per cent chromium and 7 per cent manganese, etc., 14 per cent nickel, copper.

Shrink Holes Spoil Heavy Cast Ring

We find shrink holes under the heads on a heavy cast iron ring, 31 inches outside diameter, 15 inches inside diameter and 7 inches high. The mold is gated at a single point on the joint and is fed through two risers 5 inches diameter, constricted to 2 x 3 inches at the junction and 12 inches high. The heads are not fed with a rod, but are touched up with hot iron and covered with blacking.

For feeding purpose your present risers are more of a hindrance than a help. The metal in them freezes before the metal solidifies in the casting immediately below. Thus when no more iron trickles down from the riser, the metal in the casting continues to sink in the vicinity, because it is more liquid at that point and hence in condition to be drawn away to the solidifying metal in the neighborhood. The only way to produce a perfectly solid casting is to adopt the technique of the steel foundry and place two feeders or sinkheads at least 10 inches diameter and 12 inches high in the position now occupied by the 5-inch heads.



Risers indicated in the sketch freeze before the casting and have no feeding value

A flat dry sand core ½-inch thick attached by a few nails in a suitable print in the cope will form a neck 3 or 4 inches in diameter, a neck that easily may be broken when cleaning the casting. This form of neck brings the large body of metal in the head close to the casting and is preferable to a long sloping neck which in many instances defeats its own purpose. An alternative method where an interior shrinkage cavity is not a factor, is to use no risers. The top of the casting will sink uniformly in the center and will require an extra cut to clean up, but the actual shrinkage cavity or cavities will be out of sight near the center of the casting. Still another method, if the character of the casting will permit, is to cast a smaller ring first, clean it thoroughly and place it in the mold for the larger ring with a clearance of, say, 2 inches all around. This will act as an interior chill and prevent the larger ring from shrinking to any great extent. We commend to your attention *Gates and Risers for Castings*, by Pat Dwyer which may be purchased through the book department of THE FOUNDRY.

Determine Losses In the Cupola

We shall appreciate information in a general way on the average melting loss of iron in the cupola where (a) straight pig iron is melted and (b) where the charge is all scrap.

An illuminating and extended article on the subject of melting losses by J. A. Lanigan appeared in the Jan., 1936 issue of THE FOUNDRY where it was pointed out that the actual loss of iron in the cupola is not nearly as great as is generally supposed. His observations were based on results of an extended series of heats, where every precaution was taken to secure this particular type of information.

Several years ago the late Dr. Moldenke investigated the subject of cupola melting loss. Result of this investigation presented in *Principles of Iron Founding* show the following loss for various types of iron: Machine cast pig iron 0.30 per cent; sand cast pig iron 1.00 per cent; car wheels 2.00 per cent; first quality machinery scrap 2.50 per cent; light machinery scrap 3.50 per cent; stove plate scrap 8.00 per cent.

Need Higher Sprue On Brass Casting

We are forwarding part of a brass fitting which leaks under pressure. With the exception of 5 per cent return sprue and gates, the charge for these brass castings is made up of ingot metal showing the following composition: Copper 79.6 per cent, tin 4.00 per cent, lead 2.8 per cent, and zinc 13.7 per cent. The metal is melted in an electric furnace and poured at a temperature of 2100 degrees Fahr. We have no trouble with similar type castings of a smaller size.

Melting practice and pouring temperature conform to ordinary practice and with the exception of the open grain in the heavy section, the metal in the casting presents a normal appearance. From the fact that the smaller castings are satisfactory, we are inclined to the opinion that your trouble with the larger casting is due to a sprue that is neither high enough nor large enough to feed the castings properly. Metal in the thin part of the casting freezes first and in shrinking, draws metal from the still liquid heavy part. Not enough to attract casual attention, but enough to produce slight porosity in the heavy section which sets later and has no reservoir on which to draw. Suggested remedy is a higher cope, or, alternatively a pouring cup on top of the present cope.

Corners Formed Are Not Sharp

We are making some small aluminum bronze castings which are to be used as dies for forming small statuary figures about 4 inches high. The difficulty is that we are not able to obtain sharp impressions in the cavity as the edges and corners are rounded, and consequently the dies are not suitable for the final reproductions. We have tried dry sand molds, pouring quickly, used horn gates, and even pouring basins without success.

Cast metals will only run about so sharp, after which the corners must necessarily have the resistance to flow of metal affect their sharpness. While aluminum bronze does run sharply as compared to some other alloys, experience indicates that a certain amount of chasing must be done to attain the desired sharpness on die points. Trouble usually encountered is that of obtaining a satisfactory hardness to retain the sharp edges after they have been provided by hand or machine chasing, and that can be obtained by proper heat treatment.

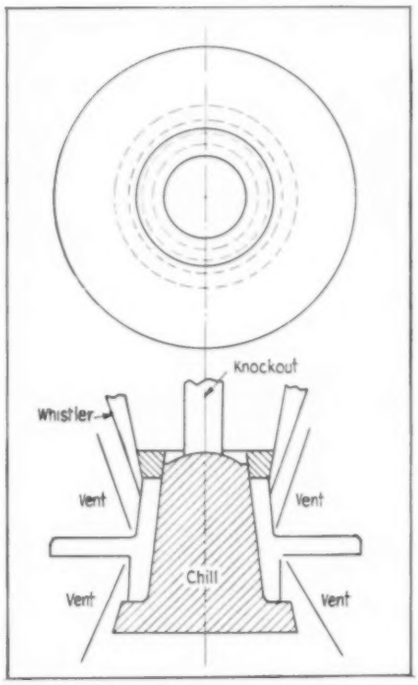
To overcome your trouble it is suggested that you provide on your pattern a little allowance for chasing at those corners which are giving trouble. That commonly is done by those familiar with such work. As far as we can see, you have employed all the methods which might aid in increasing the sharpness of the corners, and we cannot suggest any additional means of increasing the flow of metal into them.

Chill Is Not Cause Of Blowholes

We are sending a small casting in which two chills are employed, one to form the center opening and the other, a light ring around the top outside. About 25 per cent are rejected due to chill blows. We have tried a wide variety of coatings on the chills, but with no success. Formerly the castings cracked at the top edge. This has been stopped by the addition of a small amount of ferromanganese and ferrosilicon in each ladle. Do you think if the large chill was hollow in the center, thus reducing the chilling effect, it would prevent some of our trouble.

You have a complex problem in that the chill is only one factor. While it is true that chill blows result from cold, damp or rusty chills, a close examination of the casting submitted for inspection would seem to indicate that the mold and not the chill is responsible for the large cavity. The chill is partly responsible in that it caused the metal to solidify rapidly and thus prevented the gas from escaping through the skin of the casting.

With several patterns in the mold, with the runner and gates presumably occupying space in the center, and with the lower hubs extending into the drag, a tremendous amount of steam is created. All this steam has to travel down and out through the bottom of the mold. Unless a perforated bottom board is provided, or suitable provision made for the gas to escape between the edge of the drag and the bottom board, a certain amount will remain in the mold and be trapped by the molten metal.



Sand in corner pockets requires extra vents for rapid escape of steam

In the present instance we suggest an elaborate venting job is the only remedy required. The coating on the chill is of minor importance. The principal purpose is to facilitate removal of the chill from the casting. It is entirely possible that some of the defective castings are caused directly by chill blows. Chills that remain in a green sand mold for several hours condense a certain amount of moisture on the surface. Naturally in a small mold filled rapidly with metal that solidifies almost immediately, the generated steam has small chance to escape.

A precautionary method is to heat the chills before they are placed in the molds. The heated chill dries the sand to some extent in the vicinity and thus prevents condensation. As an added safety measure it may be advisable to provide two or more whistlers or small risers, about pencil size, on top of the cope hub. Incidentally and as a preventative of the cracked hubs, have you ever tried knocking the chills out of the castings immediately after they have been poured. Any one of several methods might be employed to leave small openings in the cope above the chills. Immediately after the castings have been poured, an attendant armed with a short piece of steel rod and a hammer, hits each chill a sharp blow and looses it sufficiently to prevent the casting from cracking.

Iron In Castings Is Hard To Finish

In certain castings a customer wants iron close grained yet soft enough to finish by hand tooling. We have tried annealing the castings by heating them to a cherry red, holding them at that temperature for 20 to 30 minutes and then allowing them to cool in the furnace. We also have taken them from the molds red hot and packed them in dust to cool slowly. Neither of these methods yielded the desired results. Analysis of the iron shows: Silicon 2.20 per cent, sulphur 0.08 per cent, manganese 0.55 per cent, phophorus 0.07 per cent. To this iron we have added 0.75 per cent nickel. Would you suggest the addition of 1 to 2 per cent copper in the ladle?

The fineness of the grain in gray iron castings is determined by the relative amounts of combined and graphitic carbon. This relative proportion is governed to a certain extent by the amount of other elements present, principally by the silicon content. The proportion also is determined to a large extent by the thickness of section.

With a suitable base mixture, that is a mixture calculated to meet any required physical specifications in the casting, the alloying elements can be manipulated to suit various thicknesses of casting section. For example, iron of a given analysis poured into a casting ⅛-inch thick and showing a hard grain, will present a soft, open structure in a casting 4 or 5 inches thick. Other conditions being equal, the larger the amount of steel in the mixture, the finer will be the resulting grain in the metal. In your particular instance the analysis shown (presumably for the castings and not for the charge) should show a close grain and yet be readily machinable in castings ½ to 1-inch in thickness. Possibly your trouble may be due to the annealing practice. The term cherry red is rather indefinite. Raise the temperature to approximately 1400 degrees Fahr. and hold for an hour, for each inch of thickness of the heaviest section, then cool slowly to 700 or 800 degrees.

James H. Bothwell

H. S. Hersey

R. A. Gezelius

A. J. Heysel

MEN of INDUSTRY

R. A. GEZELIUS, formerly associate metallurgist, Naval Research laboratory, Washington, has become a metallurgist of the Taylor-Wharton Iron & Steel Co., High Bridge, N. J.

At the Naval Research laboratory, Mr. Gezelius has done research work in physical metallurgy which has merited requests for similar experimentation in related fields. Included in the work done has been research on gamma ray radiography, experiments to determine the mechanism of aging in iron and steel, fundamental research on steel castings, and miscellaneous research such as preparation of experimental alloys, experimental heat treatment of alloys, corrosion testing and photomicrographic work. In connection with the work on steel castings, one of the important phases has been that of determining the contraction of cast steel while cooling from the solidifying temperature to room temperature. This phase of the problem has been completed for both free and hindered contraction of plain carbon steels.

Before entering the Naval Research laboratory, Mr. Gezelius studied at Michigan State college, where he received the degrees of bachelor of science in industrial chemistry and master of science in physical metallurgy.

♦ ♦ ♦

JAMES H. BOTHWELL recently was made foundry superintendent, Wyandotte plant of the Detroit Brass & Malleable Works. Prior to accepting the new position, Mr. Bothwell was foundry superintendent, Lockport Fittings Co., Lockport, N. Y., for 2 years. Previous to that time he was connected with the Kelsey-Hayes Wheel Co., Detroit, for 1 year and the Saginaw Malleable Iron Division, General Motors Corp., Saginaw, Mich., for 3 years. He is a graduate of the University of Detroit.

♦ ♦ ♦

HERBERT SHERMAN HERSEY, vice president and general manager, C. O. Bartlett & Snow Co., Cleveland, has been elected president of the Foundry Equipment Manufacturers' association. Mr. Hersey, who was born in Montreal, Quebec, Canada, is a graduate of McGill university. He received his early training in the mechanical arts in the plant of Pillow & Hersey Mfg. Co., Montreal, where he became head of the department for manufacture of railroad track bolts, nuts and spikes. Later he entered the employ of Dodge Mfg. Co. of Canada Ltd. as sales engineer and advanced to the position of manager at Montreal. Mr. Hersey became associated with the C. O. Bartlett & Snow Co. in 1912 as its Canadian representative. He went to Cleveland, where its plant and principal office are located, in 1915.

♦ ♦ ♦

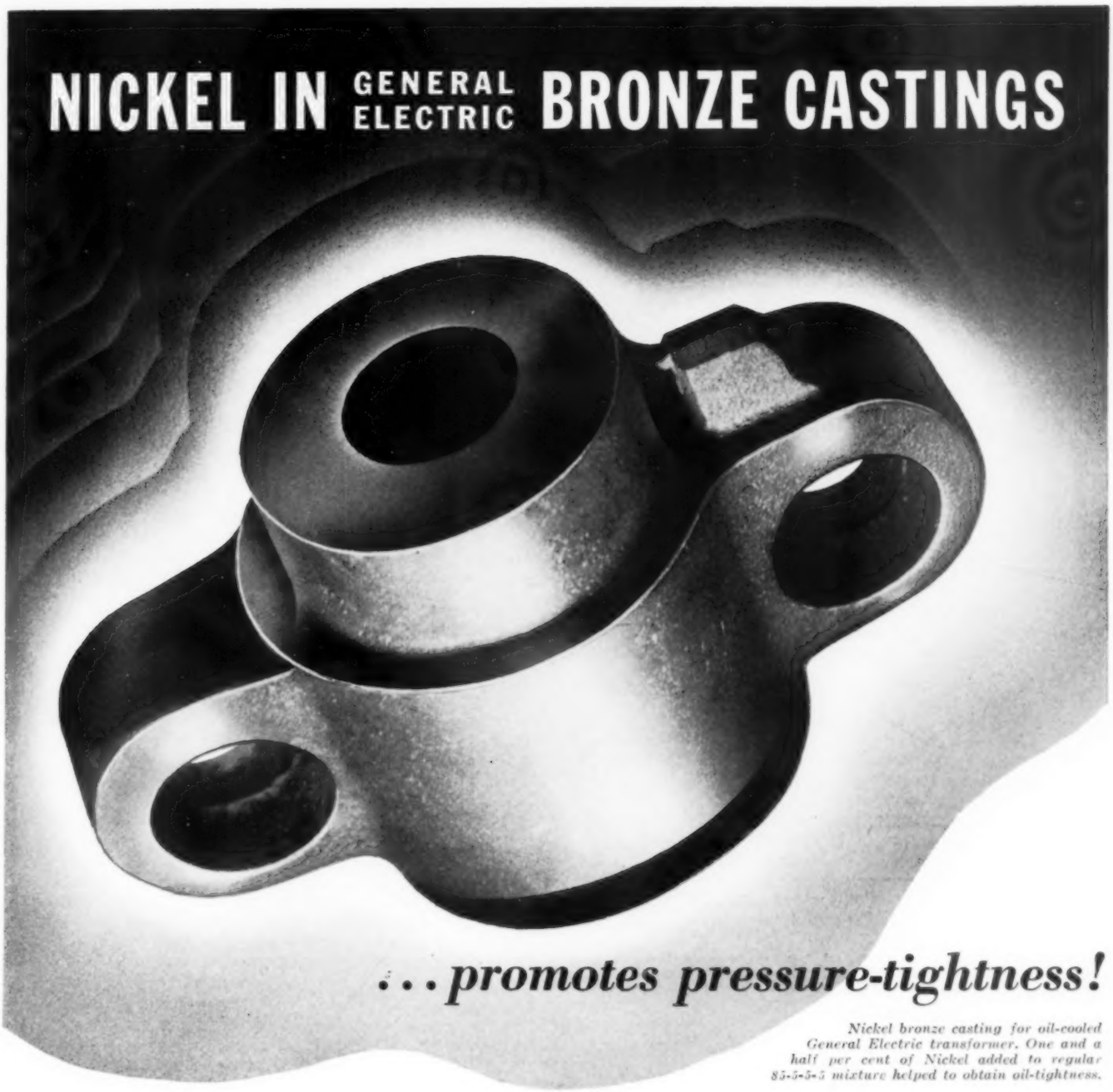
A. J. HEYSEL, former New York and Pennsylvania representative of the E. J. Woodison Co., Buffalo, N. Y., has been appointed manager of the company's Buffalo branch office. Mr. Heysel has been connected with the foundry industry for the past 17 years. After working for a number of years in the chemical laboratories of the Pratt & Letchworth Co., Buffalo, and later serving as superintendent of the foundry of the Lockport Fittings Co., Lockport, N. Y., he left the United States to go to Australia where he installed equipment for the manufacture of American type blackheart malleable iron. During the World war, Mr. Heysel was commissioned as an engineering officer in the United States navy. He was granted a leave of absence last year to go to Italy for the Whiting Corp., Harvey, Ill.

♦ ♦ ♦

JOHN L. LOWE has been made melting superintendent and metallurgist of the recently completed Centrifugal Fusing Co. plant at Lansing, Mich. Mr. Lowe was metallurgical representative at No. 1 plant, Campbell Wyant & Cannon Foundry Co., Muskegon, Mich. in 1927 and 1928. He then joined the drop forge division of the Continental Motors Co., Muskegon. From 1930 to 1933 he attended Michigan State college and was graduated with a bachelor of science degree in mechanical engineer-

(*Concluded on page 42*)

NICKEL IN GENERAL ELECTRIC BRONZE CASTINGS



. . . promotes pressure-tightness!

Nickel bronze casting for oil-cooled General Electric transformer. One and a half per cent of Nickel added to regular 85-5-5-5 mixture helped to obtain oil-tightness.

NUMEROUS bronze castings are employed in the construction of G-E transformers, which, in order to prevent liquid seepage, are required to withstand a hydrostatic pressure test. Encountering some difficulty in meeting this specification with standard red bronze commonly in use for pressure castings, the General Electric Foundry at Pittsfield, Mass. decided to look into the question of Nickel additions to their mixtures.

To the regular 85-5-5-5 bronze mixture 1½% Nickel was added. Result: Increased density and improved quality of G-E castings for oil-cooled transformers. In one run of 120 castings, every one was oil tight after all machining operations had been completed.

Add a small percentage of Nickel to your bronze compositions and you increase pressure tightness. Add Nickel to such common mixtures as tin bronze and red brass, too, and you get these *additional* improvements: Increased strength and toughness, and a fluidizing effect that facilitates casting operations and reduces misruns. Consultation on casting problems involving the use of Nickel is invited. Address:

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(*Concluded from page* 40)

ing in the latter year. He then became connected with the melting department, Saginaw Malleable Iron division, General Motors Corp., Saginaw, Mich. and a year later returned to Campbell Wyant & Cannon Foundry Co. at Muskegon. From 1934 to 1937 he was melting superintendent and assistant metallurgist, plant No. 1, head of the cupola department, plant No. 3, and melting superintendent and production metallurgist.

• • •

CHARLES D. CAREY, formerly manager of the Verona plant, American Steel Foundries, was recently appointed manager of railway sales for United States, Canada and Mexico for Gulf Oil Corp. and Gulf Refining Co., Pittsburgh.

• • •

SAMUEL H. VAUCLAIN and GEORGE H. HOUSTON have been re-elected chairman and president, respectively, of the reorganized Baldwin Locomotive Works, Philadelphia. Other officers also have been re-elected, with the exception of John P. Sykes, vice president, who resigned.

• • •

ACHILLE BRIZON, president, Association Technique de Fonderie of France, who was president of the international congress held in Paris in June, 1937, recently was honored by the French government, which conferred upon him the distinction of Chevalier of the Legion of Honor. That order was conferred upon Mr. Brizon following his activities in connection with the High School of Foundry in Paris and also for the activity in connection with last year's international congress.

• • •

ANTHONY PANICI, metallurgical chemist, recently became connected with the staff of the Certified Core Oil Co., Chicago. ROBERT S. WHEELER, formerly of Framingham Foundries Inc., Framingham, Mass., has been appointed New England representative for the company. The Russell-Hale Chemical Co., Houston, Texas, and New Orleans, La., will represent the Certified company and will carry stocks of products in both cities.

• • •

FRANK A. MERRICK, president of Westinghouse Electric & Mfg. Co. since 1929, has been elected vice chairman of the board of directors. Mr. Merrick was born in Lambertville, N. J., and studied electrical engineering at Lehigh university, where he was graduated in 1891. He joined the Westinghouse company in 1902 to work with the Canadian Westinghouse Co. Ltd. He began as superintendent, later became manager, vice president, general manager and director. In 1925 he became vice president and general manager of the Westinghouse Electric & Mfg. Co. Four years later he was elected president.

• • •

CHARLES S. PEARCE, formerly assistant director of personnel, Farm Security administration, recently has been appointed secretary, Por-

Charles S. Pearce

celain Enamel institute, Chicago, filling the position vacated by GEORGE P. MACKNIGHT.

• • •

GEORGE H. BUCHER, executive vice president of the Westinghouse Electric & Mfg. Co., has been elected president of the company. Mr. Bucher, who began his work with the Westinghouse company in 1909, was a graduate of Pratt institute, Brooklyn. He worked successively as a coil winder, as a worker in the transformer assembly, and as a motor generator tester. Two years later he was transferred, as a clerk, to the export department of the company. In 1920 he was appointed assistant to the general manager of the Westinghouse Electric International Co., and a year later, 1921, assistant general manager. He held that position until 1932, when he was elected vice president and general manager. In 1934 he was elected president and general manager of the International company. The following year he became vice president of the parent company, the Westinghouse Electric & Mfg. Co. In 1937 he was named executive vice president and a director.

Engineering Experiment Station, Purdue university, Lafayette, Ind., has published a 44-page bulletin entitled, "Report of the Research and Extension Activities of Engineering Schools and Departments for the Sessions of 1936-37".

British Institute Holds Meeting

British Institute of Metals held its thirtieth annual meeting at the Institution of Mechanical Engineers' hall in London on March 8 to 10. At the opening session following the business proceedings, the first award of the institute's medal was made to Sir William H. Bragg, president, Royal society, noted for his investigations in X-ray examination of metals, and in other fields of scientific research. . The medal, which was offered to the council of the institute by the Mond Nickel Co. Ltd., is pure platinum, and is awarded for outstanding services to nonferrous metallurgy.

After presentation of the medal, retiring president W. R. Barclay inducted the president-designate, Dr. C. H. Desch, into the chair, and he delivered his presidential address on, "A Chemists' View of Metallurgy." The two following days were devoted to technical sessions and works visits with the annual dinner and dance taking place at Grosvenor House on the evening of March 9. During the meeting details of a joint meeting in Canada and the United States of the Institute of Metals and the Iron and Steel institute in the coming autumn were given. It also was announced that the Institute of Metals and the Iron and Steel institute will share office and other accommodations at 4 Grosvenor Gardens, London.

Officers elected to serve during the year 1938-39 include President Dr. C. H. Desch, National Physical laboratory, Teddington; Vice President, Prof. J. H. Andrew, The University, Sheffield; Members of Council, Dr. J. W. Donaldson, Scott's Shipbuilding & Engineering Co. Ltd., Greenock, Scotland; Engineer Vice Admiral Sir George Preece, and H. S. Tasker, Goodlass Wall & Lead Industries Ltd., London. Election of 118 new members also was reported.

Consistency Tests

American Society for Testing Materials, 260 Broad street, Philadelphia, has published a 73-page bulletin entitled, "Symposium on Consistency-Critical Discussion on Present-day Practices in Consistency Measurements". It contains 9 technical papers with discussion and covers a cross section of engineering materials for which measurement of consistency, plasticity, viscosity and related properties is important. Materials discussed include asphalts, coal tar, petroleum products, rubber, plastics, etc. Copies of the bulletin may be obtained from the society for 85 cents each.

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American Cast Iron Pipe Co., Birmingham, and co-chairman of general committee

W. O. McMahon
Sloss-Sheffield Steel & Iron Co., Birmingham, and co-chairman of the program committee

J. E. Getzen
Stockham Pipe Fittings Co., Birmingham, and co-chairman of program committee

G. R. Ozley
Alabama By-Products Co., Birmingham, and co-chairman of general committee

Birmingham Beats All Records

SIXTH annual joint foundry practice meeting, held at the Tutwiler hotel, Birmingham, Ala., Feb. 24 and 25, broke all previous records for a regional foundry conference. A total of 625 foundrymen and engineers, representing 15 states, registered for the two day meeting, thus exceeding the attendance at any similar gathering in other parts of the country.

Credit for the success of the meeting should go to the committee members representing the Birmingham district chapter of the American Foundrymen's association and the Birmingham section of the American Society of Mechanical Engineers, the sponsoring groups. R. R. Deas Jr., American Cast Iron Pipe Co., Birmingham and George R. Ozley, Alabama By-Products Co., Birmingham, were joint chairmen of the general committee for the conference. The program featured four technical meetings, a luncheon, a dinner and a morning devoted to plant visitation.

The first session, held Thursday morning, Feb. 24, was devoted to "The Cupola Furnace—Design, Construction and Maintenance" and was under the chairmanship of C. B. Saunders, Tennessee Coal, Iron & Railroad Co., Birmingham. W. L. Roueche Sr., McWane Cast Iron Pipe Co., Birmingham, in a paper "The Balanced Blast Cupola," stated that the main difference between the conventional cupola and the balanced blast unit had to do with stack dimension and the tuyere design and arrangement. The tuyere system consists of one row of main tuyeres entering the lower level of the bed and two or three rows of auxiliary tuyeres admitting a measured amount of air into the upper levels of the bed. The main tuyeres are equipped with special valves permitting close regulation of the air entering, and the auxiliary tuyeres also are adjustable. Number and size of main tuyeres and auxiliary tuyeres vary with the size of the cupola, according to Mr. Roueche.

Control Air Volume

The speaker pointed out that when the furnace is put into operation, the proper setting for the auxiliary tuyeres is developed after the first two or three heats, and once determined that setting is not altered unless there is a material change in the character of the burden or quality of the coke. Valves on the main tuyeres are provided with a gate which permits closing each of the main tuyeres for a period of 8 to 10 minutes in consecutive order without changing the setting. This permits any chilled iron or slag to be melted away and keeps the tuyeres open and free from obstruction, prevents bridging and insures a clean drop, according to Mr. Rouche. Cupolas of the balanced blast type are operating successfully on daily heats up to 24 hours. The speaker stated the main advantages to be obtained from the use of the balanced blast design are more economical melting, increased tapping temperature, improved quality of metal as a result of lower sulphur pickup, and better melting conditions. Data illustrating the results of balanced blast cupola operation were presented.

In the second paper, J. W. Cotlin, American Cast Iron Pipe Co., Birmingham, discussed "The Acipco Hot Blast Cupola." To meet special melting conditions, the company some years ago adopted the idea of passing the blast through cast iron sections set in the wall of the cupola below the charging door and above the melting zone. After using that type of equipment for about 8 years, increased demands on the melting equipment resulted in the replacement of the iron castings with a series of U tubes. In this unit, the cold air comes into an upper bustle pipe, passes down through the tubes to a lower bustle pipe and then through cast iron downcomers to the tuyeres and into the cupola. The melting zone is lined with refractory blocks up to the bottom of the tubes. Standard 9-inch bricks are used between the tubes and the shell. Above the tubes, iron bricks are used for the lining, which, with hot blast equipment, are claimed not to be subject to extreme temperature conditions.

Mr. Cotlin explained the construction of the hot blast equipment and the safety features which have been developed to cut out any part of the equipment should leaks develop. He stated that from a series of heats, ranging from 3 to 16 hours each, it has been found that the

(*Continued on page* 46)

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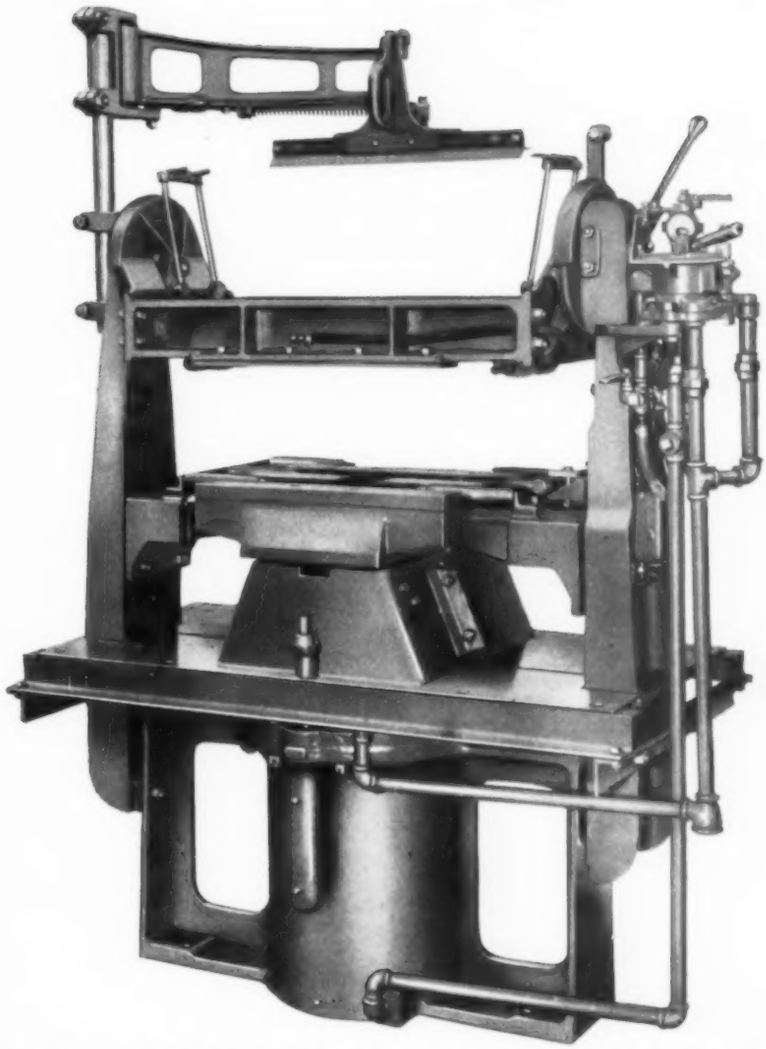

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(*Continued from page* 44)

average life of the hot blast tube is approximately 150 heats. Operating the cupola on alternate days affords ample time for ordinary repairs and tube replacement. Ordinarily all required repairs and replacements are made in about 3 hours with a crew of four men. It is claimed that the cupola is very flexible and may be operated through short shut down periods and the melting rate varied over a wide range without appreciable loss of temperature. The present cupolas are operated with an iron to coke ratio between charges of from 10 to 1 and 12 to 1. On the old cold blast cupolas for that type of service, the company used a coke ratio of 7½ to 1. The speaker pointed out that this represents an average saving of about 30 per cent in coke.

Cupola Is Described

"The Griffin Hot Blast Cupola," was discussed by L. H. Rudesill, Griffin Wheel Co., Chicago. Mr. Rudesill described in detail the entire mechanism of the heater installed on a standard cupola. He stated that an exhaust fan controls and draws the air through the heater. Gas is taken from the cupola to a combustion chamber and burned at 1600 degrees Fahr. It then is passed through to a set of cast iron tubes and is exhausted into the atmosphere at 500 degrees Fahr. Cold air, delivered by a positive pressure blower, enters the heater at the point where the hottest gases are conducted from the combustion chamber. Mr. Rudesill pointed out that this keeps the iron plate, which separates the gases from the air, below 1000 degrees Fahr. and thus prevents warping. Air passes around the gas tubes, through a chamber and around a second set of tubes and then enters the cupola at 600 degrees Fahr. The heater is constructed entirely of metal, with the exception of the lining for the combustion chamber. The speaker stated that records over a 10-year period show a total coke saving of 185 pounds per ton of metal melted, and between charges of 145 pounds per ton of metal melted. This data indicates, according to Mr. Rudesill, that the saving in coke over the period has been 39½ cents per ton of product.

In discussing "The Plain Cupola," Clyde Hagler, Continental Gin Co., Birmingham, stated that in small foundries where the melt is 20 tons per day or less, the plain cupola appears to be better suited than those using hot blast, etc. Mr. Hagler described the construction and operation of the cupola, dwelling particularly upon the tuyeres. In his opinion, the area of the cupola tuyeres to that of the cupola cross section should be from 1 to 4, to 1 to 6 for good operation. He stated that few small cupolas use more than one row of tuyeres. Mr. Hagler believes that the height of a charging door above the bottom plate in hand charged cupolas should be from 12 to 15 feet and in machine charged units, from 18 to 20 feet.

All the papers were discussed as a unit. In response to a question

R. C. Harrell
Stockham Pipe Fittings Co., Birmingham, and secretary Birmingham Chapter of A. F. A.

by V. A. Crosby, Climax Molybdenum Corp., Detroit, Mr. Roueche stated that it would be possible in the balanced blast cupola to maintain throughout the heat the high temperature which now is secured during the first half hour. He mentioned that the first four charges use a coke ratio of 10 to 1, and after that the ratio is increased to 15 to 1. The high temperature is employed at the beginning to heat the cupola quickly. Mr. Roueche also stated that balanced blast cupolas could be operated at 2800 degrees Fahr. and that a unit in Utah has been operating for some time on an average of 2750 degrees Fahr.

In reply to a question regarding advantages of using a hot blast or balanced blast unit for heats as short as 2 hours, it was stated that the Acipco unit was designed for long heats where a saving of approximately 30 per cent would be effected. Data on a 3-hour heat show a saving of approximately 12 per cent. In the Griffin hot blast greatest efficiency starts after about 30 minutes. During the first half hour, the efficiency increase is about 10 per cent. In the balanced blast cupola, it is claimed that a decided increase in efficiency and a saving in coke is secured in short heats. Normal melting rate on that type of unit is considerably higher than on the regular cupola.

A. W. Gregg, Whiting Corp., Harvey, Ill., pointed out that in his opinion the greatest saving in the use of a hot blast unit was not in coke but in reducing oxidation. In reply to a question from James T. MacKenzie, American Cast Iron Pipe Co., Birmingham, as to whether or not a hot blast unit has been hooked up with a balanced blast cupola, F. C. Herbster, Sheffield Steel Corp., Kansas City, Mo., stated that an installation was being made whereby a Griffin hot blast unit was being built with a balanced blast cupola. The furnace will be used to provide hot metal for an open hearth furnace.

Change Volume of Air

It was brought out that a balanced blast cupola has been operated where the melting rate has varied as much as 30 per cent per day. In changing the rate, it is not necessary to change the upper or lower tuyeres but simply change the volume of air introduced in the windbox. It was also stated that the tuyeres enter the cupola at an angle of 90 degrees to the shell, and do not have any down rake. Also, it was mentioned that one balanced blast cupola now is operating 24 hours at a time and that it is exceptionally free from bridging. When it is necessary to shut down that type of cupola from a short period to as much as 3 hours, the temperature comes back promptly. Considerable difference of opinion developed as to the value of a double row of tuyeres.

Hyman Bornstein, director of testing and research laboratory, Deere & Co., Moline, Ill., and president, American Foundrymen's association, was the guest speaker at the luncheon on Thursday noon, at which R. R. Deas Jr., chairman of the Birmingham district chapter of the A.F.A. presided. Mr. Bornstein spoke of the work of the association, and pointed out that members benefitted through papers, annual conventions and exhibitions, publications, chapters, technical committees, co-operation with engineering schools and the safety and hygiene section. According to President Bornstein, because of the success of the chapter movement, the A. F. A. is at the highest point in the history of the association. Prior to the main talk, J. M. Morgan, associate commissioner, City of Birmingham, welcomed the visitors to the Alabama metropolis.

The afternoon session, with Lester N. Shannon, Stockham Pipe Fittings Co., Birmingham, as chairman, was devoted to "Cupola Charging Equipment." Waldeck Levi, Lynchburg Foundry Co., Radford, Va., presented a paper, "Mechanical Cupola Charging in the

(*Continued on page* 48)

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(*Continued from page* 46)

Cast Iron Pipe Industry." Mr. Levi illustrated and described the Shepard cupola charging equipment used in charging four cupolas in the pipe plant of the Lynchburg Foundry Co. Mechanization of the cupola charging operation at that plant required the installation of an iron yard crane and magnet for loading the cupola charges, an electric charging crane complete with nine charging buckets of special design, cutting a hatchway 31 x 15 feet in length in the charging floor and enlarging the charging door openings in the cupola as well as other minor changes. While not essential to mechanical charging, the company also equipped the cupolas with front slagging spouts. Two teapot mixing ladles have been installed, so arranged that either one or two cupolas can be tapped into the ladles at the same time. All of the metal is treated in the mixing ladles with fused sodium carbonate. Cupola slag is run into a stream of water which breaks it up and carries it directly to hopper cars placed behind the furnaces.

Contributes To Efficiency

The speaker stated that mechanical charging, in addition to reducing the number of men required, has made the charging operation considerably more pleasant due to the fact that the men do not have to face the rather severe heat conditions almost always present on the charging floor level. Furthermore, it has enabled operators to clean house on the charging floor. All of these factors, he believes, contribute to more uniform and more efficient cupola operation.

In the second paper, A. W. Gregg, Whiting Corp., Harvey, Ill., discussed the "Whiting Wish Bone Charger." Mr. Gregg described the construction of the wish bone charging equipment and stated that the greatest advantage from mechanical charging is in the saving of labor. Furthermore, because of more comfortable working conditions and absence of fatigue, mechanical charging actually will provide a more uniform job of charging than can be done by hand. It was stated that the cone bottom discharge requires a clearance of 10 inches between the bucket and the inside cupola diameter, which means the inside diameter of the cupola must be at least 52 inches to utilize that type of equipment. A 42-inch cupola may be equipped with a drop bottom bucket since only 5 inches clearance is necessary between the cupola and the bucket. The speaker stated that the advantages to be gained by the use of a mechanical charging system are by no means theoretical, and many installations have paid for themselves in a year or less.

Combination of mechanical hand charging was described by Victor Szwed, U. S. Pipe & Foundry Co., Birmingham, in a paper entitled "The Dump Charger." The plant is equipped with a double parallel crane runway, and stock is handled to the cranes on a narrow gage railway. Trays are loaded with various grades for the charge, picked up and carried to the charging floor where the trays are placed on a chute built at an angle of 45 degrees to the horizontal. The top of the tray is attached to the chute and as the tray is lowered, the material is discharged into the chute and is carried to the cupola charging door.

Shipments of iron are so arranged that the cars are spotted and the iron is used directly from the cars in making up the charge. This also is true in connection with the purchased scrap iron. However, the supply of both iron and coke is maintained in the yard, for emergencies. Coke also is delivered on schedule and the coke charges are measured by volume. Coke is hand charged to the cupolas. Limestone is unloaded between the dual runways, delivered to the charging platform on pans, and is hand charged. In the beginning, the cupola is charged to the level of the charging door by hand, and then the remainder is charged through the chute as the cupola is placed in operation.

Use Charging Box

Dan Guldberg, American Cast Iron Pipe Co., Birmingham, discussed "The Acipco Charger." In this installation, raw materials are handled in a charging box which is raised from the iron yard level by an electric overhead high-speed crane. The box is placed on a charging machine located on the charging floor, and so designed that the crane operator can charge the cupola without leaving the cage. When the charging box is spotted over the charging machine, ready to be lowered, the crane cage is in such a position that the operator has full view of the charger and can see the inside of the cupola through the charging door. A valve controlling a hydraulic cylinder is attached to the cupola shell within easy reach of the cage. In operating the valve the pressure underneath the plunger of the hydraulic cylinder gradually is relieved and the carriage with tilting frame and box is started by gravity on its way toward the charging door of the cupola.

An interesting paper entitled "We Built Our Own Skip Hoist Charger" was presented by E. B. Bradley, Phillips & Buttorff Mfg. Co., Nashville, Tenn. The speaker discussed the special needs of the foundry which melts an average of 75 tons per day in two cupolas, the metal being poured in stove plate castings. The charging equipment consists of a trackway running from the make-up yard up over the roof of the foundry, splitting into a Y in front of two stacks set 15 feet apart. Either leg of the Y enters a cupola charging door 21 feet above the bed. At the charging doors an auxiliary dump track is gaged a foot wider than the regular car track to engage outboard rear wheels of the car for dumping as the nose enters the doors.

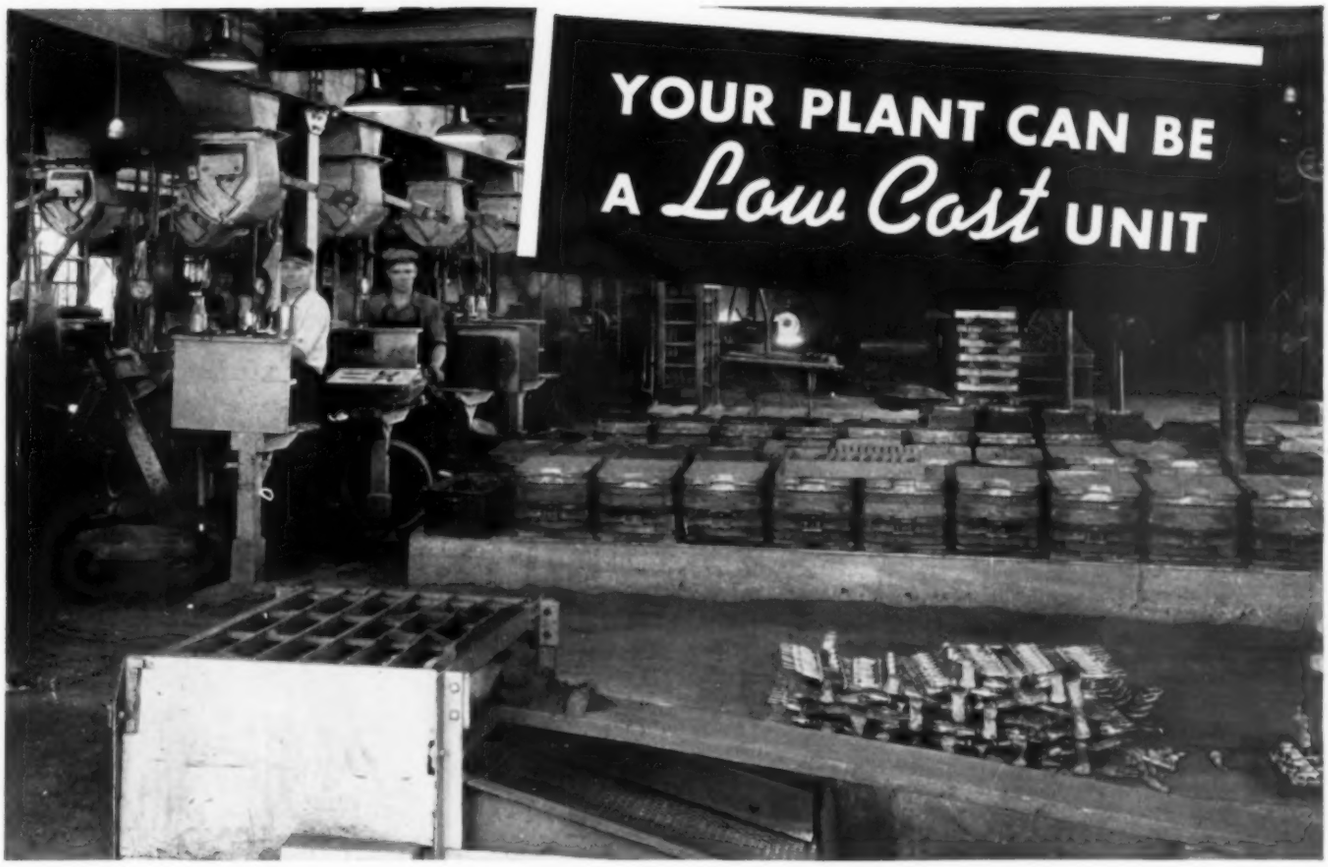
Holds Complete Charge

The all-steel car used to carry the charge to the cupola resembles a half a small boiler on wheels with the nose torpedoed step cut. The car holds a complete 2000 pound change of stove plate iron, coke and limestone. The rear 2 feet of the car is separated from the rest by a semicircular sheet of steel hinged at the top so that it swings easily. Mr. Bradley pointed out that this partition is held in place by a pin through the side of the car and forms a coke box which holds 6 or 7 cubic feet of coke, which is dumped after the charge has entered the cupola. The car is handled in the usual skip hoist manner by a cable running through a series of sheaves to a standard elevator drum hoist located below the trackway. The entire hoisting and dumping operation is controlled by a switchboard, and to insure continuous operation of the system, the company installed duplicate wiring and switches. Features stressed in this installation include low cost, simplicity, continuous operation with very low upkeep, and effective charging of the cupolas.

The advantages of charging by hand were outlined by Lynn Malloy, Anniston Foundry Co., Anniston, Ala. The speaker described briefly the method employed at the Anniston company in handling the material and in charging the cupola by hand. He stressed the point that foundrymen should see that the cupola melting report balances with the stock pile. Considerable discussion on the various phases of the different charging units described in the papers followed the formal presentation.

A large and interested audience listened to a paper "Foundry Control with Mechanical Cupola Charging as Practiced by the Caterpillar Tractor Co.," which was presented Thursday evening by M. J. Gregory, Caterpillar Tractor Co., Peoria, Ill. Gordon Jones, U. S. Pipe & Foundry Co., Bessemer, Ala., presided. Mr.

(*Concluded on page* 50)



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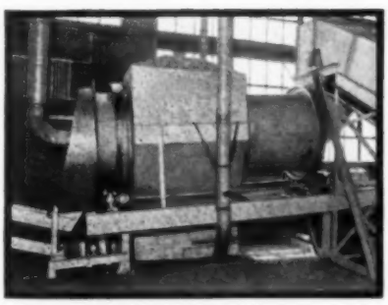

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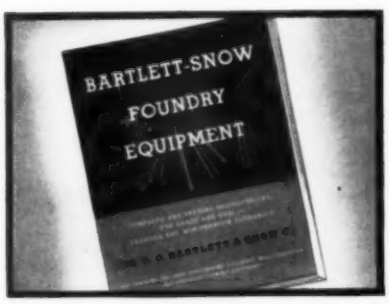

BULLETIN No. 75. Complete with 120 illustrations and 26 engineering diagrams, this 44-page booklet describes the Bartlett-Snow method of securing less costly; more efficient operation. Send for one!

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SAND HANDLING AND SAND CONDITIONING EQUIPMENT
MOLD CONVEYORS AND ACCESSORY FOUNDRY EQUIPMENT

(*Concluded from page* 48)

Gregory divided his instructive talk into three sections as follows: First, the why and how of mechanical charging; second, cupola control; and third, metal mixtures and their control.

The Caterpillar company melts 400 tons a day, the entire amount being handled by four men. A magnet is used for making up the charges and a knife switch permits accurate amounts of iron to be dropped into the scale. The company uses briquets of cast iron borings and steel turnings, the steel briquets being 69 per cent solid, and the cast iron 81 per cent solid. In charging the materials, two types of buckets are used. Metal is charged in a cone bottom bucket and coke and limestone in a hinged, split-bottom bucket. The latter keeps the limestone away from the lining.

Mr. Gregory stressed the accuracy of the method employed in making up the charge, and stated that the magnet method produced excellent results. He stated that he secures uniform iron which is hot. At the cupola spout, the temperature runs about 2850 degrees Fahr. and is checked every 15 minutes. The coke bed is from 60 to 65 inches above a single row of tuyeres. Two funnels are provided at the spout, one for adding alloys and one for adding graphite to the metal. He stated that extra coke is added to the third, sixth and ninth charges since he has found that this produces excellent results for the first ¾-hour operation and also does away with later difficulties. It was said that iron at the spout costs $16 a ton, exclusive of alloys. Considerable discussion followed presentation of the paper.

On Friday morning, an exceptionally large group of foundrymen and engineers took advantage of the splendid plant visitation program arranged by the general committee. Visitors were given an opportunity to see the many modern foundries operating in Birmingham and the surrounding territory.

The final technical session on Friday afternoon was devoted to "Selection of Cupola Blowing Equipment," by S. D. Moxley and W. Thomas Barr, American Cast Iron Pipe Co., and presented by Mr. Moxley.

R. M. Marshall, Woodward Iron Co., Birmingham, presided. After describing in considerable detail the various factors and characteristics found in the different types of blowers, Mr. Moxley concluded that in selecting blower equipment a thorough analysis of the metallurgical and operating conditions first should be made. Maximum pressures and volumes should be established at the beginning. Next the average pressure and volume conditions should be studied and an assumption made to arrive at what proportion of the operating time the various pressures and volumes will be required. To meet these conditions, the best combination using each type of blower should be considered for capacity, pressure, control, etc. Selection of the particular type of equipment can be considered on the basis of installation cost and yearly power consumed.

Such questions as maintenance, flexibility, adaptability to possible future plant changes, space requirements and noise are largely local matters, according to Mr. Moxley and entirely depend on local requirements. In the speaker's opinion, every cupola blowing job has its peculiarities and its differences from others. Therefore, there is no particular type of equipment that is best suited for all jobs, but each type has distinctive advantages under some conditions. Representatives of several types of blowing equipment included in the study, were present to discuss further certain phases of their own blowing units.

Approximately 300 attended the banquet held Friday evening at the Tutwiler hotel. George R. Ozley, Alabama By-Products Co., Birmingham, presided and John M. Gallalee, dean of mechanical engineering department, University of Alabama, Tuscaloosa, Ala., was toastmaster. The speaker of the evening was Spencer McCallie, headmaster for the McCallie School for Boys, Chattanooga, Tenn.

Foundry Samples Every Ladle of Iron

CLOSE control of composition and melting procedure, as practiced in many progressive foundries, is exemplified in this illustration prepared from a photograph taken at Pontiac Motor Co., Pontiac, Mich. In that foundry a sample is taken from every ladle of iron and poured into small test ingots as shown here, and into chill bars. Every chill bar is broken for fracture examination to determine whether or not the iron possesses the proper characteristics. Some of the test ingots are drilled to obtain samples for determination of chemical composition.

Book Review

Electricity and Magnetism, by S. Leroy Brown, cloth, 310 pages, published by Henry Holt and Co., New York, and supplied by THE FOUNDRY, Cleveland, for $2.80 and in Europe by the Penton Publishing Co. Ltd., London.

Although the subject of electricity and magnetism has many subdivisions, and includes a great variety of manifestations of a comparatively few fundamental phenomena, this new text by S. Leroy Brown, professor of physics at the University of Texas, includes only the more basic principles that have been developed from the study of these phenomena. Since it has been designed to assist the work of elementary classes, it has been made as concise as possible.

Definitions are indicated by italics; and each chapter is supplemented with problems and experiments intended to illustrate and emphasize the principles as well as to furnish a drill for the student in their applications. The many electrical appliances in use today, ranging from electrical toys and electrical doorbells to electric locomotives and complicated communication systems, furnish an excellent background for a beginning of the study of electricity and magnetism.

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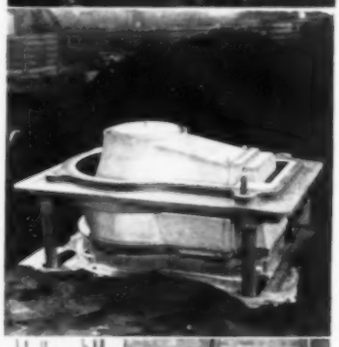
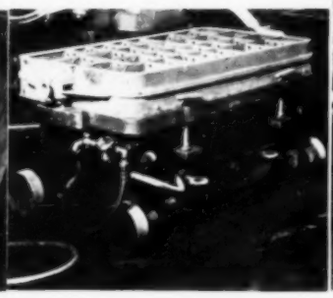
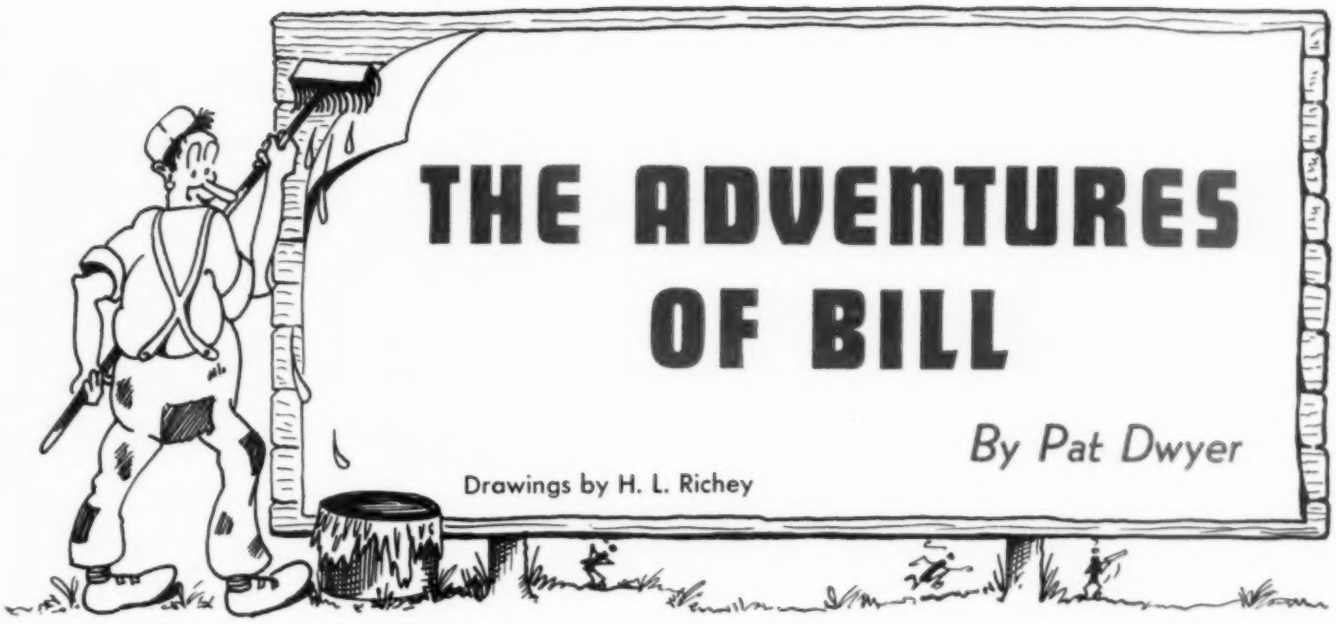






THE ADVENTURES OF BILL

By Pat Dwyer

Drawings by H. L. Richey

BILL came in the other night bubbling over with enthusiasm for a picture, *Snow White and the Seven Dwarfs*, recently shown at one of the theaters. According to Bill—and his opinion apparently is shared by several million fellow citizens, citizenesses and citizenets, or whatever you call Betty Jane and Junior in mass formation—the picture was the most gorgeous and satisfying spectacle ever presented on the screen.

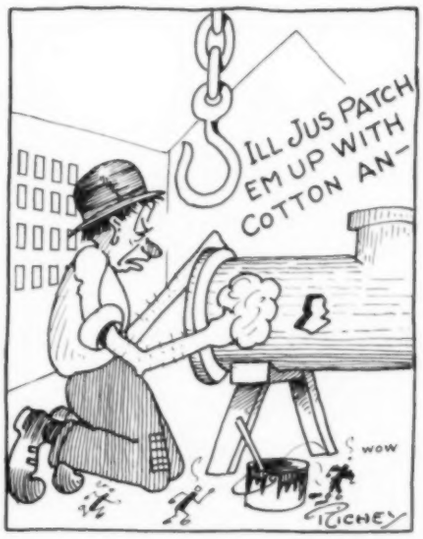
"Color, action, suspense, drama," said Bill, "it has everything. Triumph of virtue and innocence over vice and jealousy. A charming little maiden for a heroine; a flock of woodland creatures with more intelligence, sympathy and understanding than would be found in a similar number of human beings; a beautiful little house in a bosky dell and a band of seven dwarfs with hearts of gold, but with noses like young dirigibles. Sprightly songs and dances in perfect harmony with the general spirit—"

"No need of shouting," I said. "I saw the picture and if any person is sufficiently interested to ask for my vote I unhesitatingly will cast it for *Snow White* as the best picture of the year, or for that matter of any other year. When it turns up in our neighborhood theater I propose to see it again."

"That's the good old spirit. You could see it a dozen times and it would not do you any harm. The most gratifying feature so far as I am concerned, is that the universal appeal of the picture bears out a contention I have been championing for many years. Makers of pictures claim that the public wants nothing but stories showing wholesale and retail smashing of the fifth or sixth commandment, depending on whether the individual spectator is a subscriber to the King James or the Douay version. Other essential features include scenes of violence, robbery, murder and at least one view of a cabaret where crooks and criminals, ex, actual and potential, in tail coats live the life of Reilly between professional engagements.

"Possibly a neurotic, mentally deficient section of the population enjoys that kind of tripe, but it does not appeal to the majority. With this stuff forced down its throat by the know-it-all producers the patient public either has had to take it or do without entertainment. Maybe the instant and spontaneous success of *Snow White* will convince the high command that John Q. Public is not a moron, a nitwit or a criminal at heart."

"While commending your courage," I said, "for putting into words what many people are thinking, I see no occasion for frothing at the mouth. Get the old emotion under control. Take a leaf from the book of the seven dwarfs and whistle while you work."



The filler-upper does his stuff

"Whistle while you work, eh? You did not notice old Grumpy doing any whistling, did you? Always bound to be at least one sour puss in every group. Six happy little fellows plied their picks in the mine and at the same time whistled a right tuneful melody in a manner that would have earned them a place on any professional program. If you remember they even had the birds on the trees working at top speed to keep up with them. Grumpy did not cock a lip and join in the roundelay. Heart of gold and all that stuff is shown later in the story, but in the early stages he wore a perpetual frown, spat out of the side of his mouth and admonished the brethern to mark his words, nothing good would come of this, that or the other.

"Talking about Grumpy and his frowning outlook on everything in general reminds me of a letter I received the other day from a lad who apparently has lost all his first enthusiasm for the foundry business and now looks upon it as practically a lost cause. In effect he begs me to mark his words. Nothing good will come of it. The foundry business. Bah! Two bahs. One for the day he entered it and the other for present day conditions."

"Is this just a general indictment or does the comrade set forth a bill of particulars? Does he merely point the finger of scorn and so forth at the foundry, per se, ipso facto, dixie doodle and what have

you, or does he present definite and distinct allegations which may or may not affect the social, moral, financial or other standing if any of the defendant? Come, come my good man speak up. Answer yes or no?"

"How would you like to take a good long running dive off the far end of the breakwater my good man? That line of chatter may be all right in a court of law where a brow beating attorney is permitted to act in a manner that would earn him a belt on the nose in any other environment. We are not in a court of law now my good man, so kindly can the good man stuff, my good man, and let us get on with the work."

"And whistle while you work! From now on I shall act the part of Bashful."

" 'Tis not the role I would assign you if I was making the cast. Dopey or stuttering Doc would be more appropriate. However, all this idle talk has no bearing on the point at issue. Just cuddle down in your little short chair and you'll hear a tale that will curl your hair—what little you have left.

"This here now comrade I was telling you about mixes himself a venomous brew of green ink, dips the pen therein, draws a long breath and hits out right and left as follows:

Dear Bill: Ever since your homely old mug first appeared in your *Tales From the Gangway* about twenty years ago—kindly check me on this—I may be out a year either way—I have enjoyed these articles in THE FOUNDRY. However, I must confess I appreciated those ending with a shop point the most. You know the good old smelly atmosphere, the core smoke, the heat and the casting that no one could make until our hero came along. Maybe my sense of humor is on the wane,

What great gaggers you had Granpa

kind of withered like the flowers of the forest that faded away, but somehow in recent years I sort of get the impression that you are slipping a little. Kind of a little sour now and again like a pan of milk after a thunderstorm. With this thought in mind, with charity for all and malice toward none, might I suggest that you take a trip to this part of the country. Here you can get a proper grip on yourself and pick up some real funny ideas. For example here are a few culled at random. All actual instances, mind you. They will give you some idea of the rich mine available in which you might dig to your heart's content. No use telling these stories to farmers, lumbermen, sailors or fellows who sell shirts, shoes or socks. However, the boys in the shop, especially the lads who have had the same or generally similar experience, will get a kick out of 'em. Just send me a post card before you stow away on the rods or the blind baggage and I'll meet you out by the water tower. No. 6 is the best. She whistles for the semaphore about 5 p.m.

No. 1—This one is about the foreman of a valve and fittings shop. Some of his large pressure castings came out of the cleaning room with shrinkage holes in 'em. The holes were not big enough, as the saying goes, to bury a dog, but they were plenty big enough to almost give this bird heart failure. Instead of breaking 'em up and thus earn an earnest bawling out from the front office, he packed the holes with cotton batting and then smeared the surface with a mixture of googum widely used with perfect propriety in repairing small surface defects. Alas and alack, he had to walk the plank when the big boss got a brief note from an angry customer. The note was accompanied by a shoe box filled with rusty cotton batting. Next day a big locomotive slouched into the yard and left a car load of rejected castings and a freight bill.

No. 2—Here is one that will kill you. A specialty shop among other equipment had two old leather piston type squeezer machines. To step up production, one of these was scrapped and replaced by the latest type jolt squeezer. On the new machine the operator easily earned from $12 to $13 a day, while the best his partner could do on the old cripple was to knock out about $7.00. His continual squawk was a pain in the neck to the superintendent. The big boy went into executive session with himself and as a result he hit upon a truly remarkable and clever solution for this knotty labor problem. You have been on shop committees, Bill, away back in the old Martin Fox and Joe Valentine days and you have seen some queer settlements, but I'll bet you can't guess how this little affair of honor was settled.

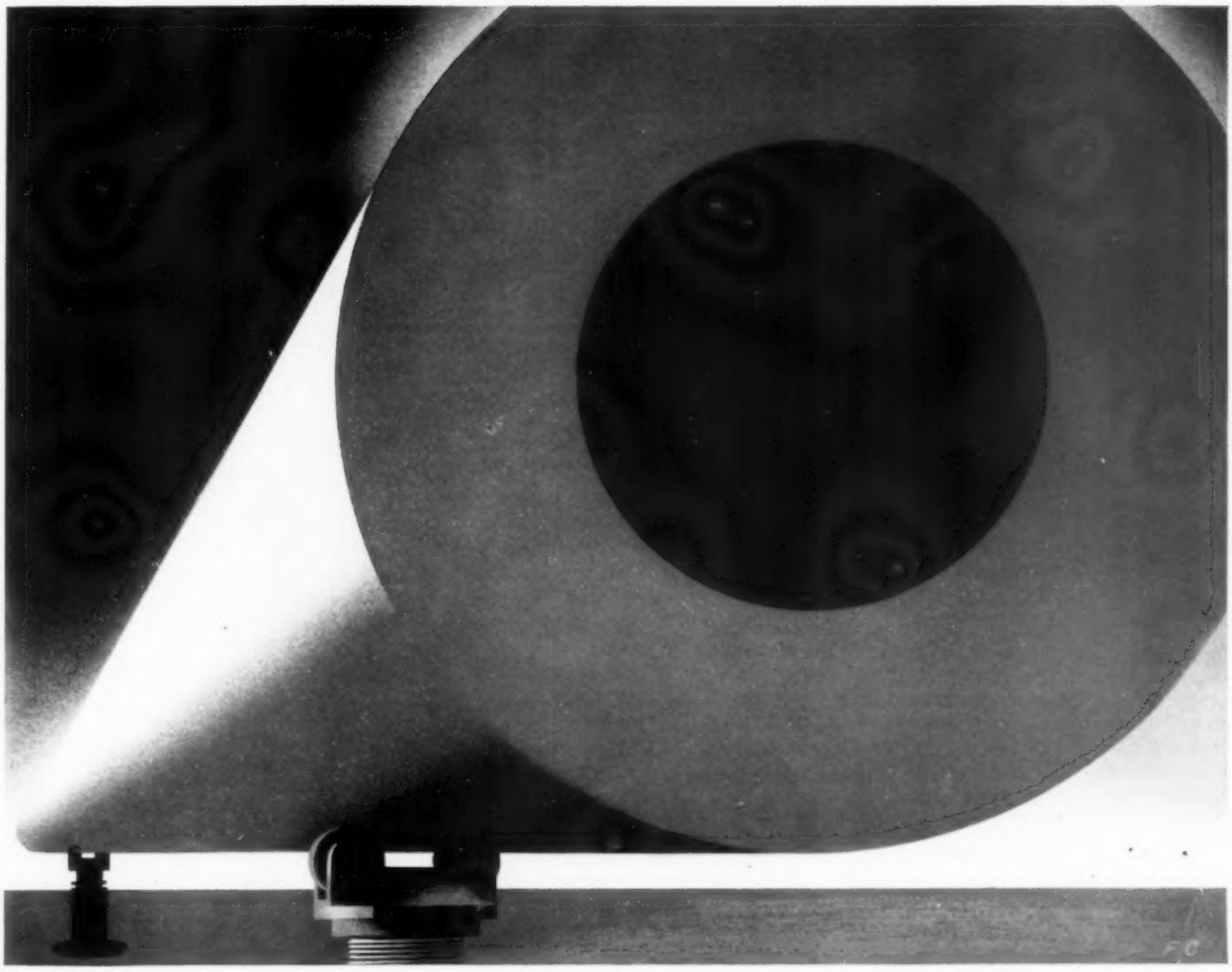
I hope to spend the remainder of my life in the dog house, if the Supe did not give the man on the new machine all the loose stuff, and put all the matchplate stuff on the machine operated by Dopey. Naturally the hare's output was cut down to a point where he earned only as much as the tortoise. Maybe I have the wrong conception of the idea in installing modern machinery. Maybe when and if you get here and have the cinders combed out of your hair, you can put me wise. Maybe like Walter O'Keefe, I am just stupid.

3—Here's one for the book. A brilliant young college graduate foreman ever alert to new ways of cutting costs had some home made chaplets galvanized for a special job. The molder entered a mild protest, but what chance has a lad who barely had made the sixth grade against an expert with a Phi-Fo-Fum degree in business administration from Ballyhooly institute? Later for fear of jeopardizing his job he had to stand meekly with eyes downcast and let the superintendent bawl the pants off him for being so dumb, while the foreman kept discreetly silent.

4—Most of the shops around here

(*Concluded on page* 88)

Nothing like a bath (with salts) to promote morale and efficiency



HUGE—YET UNIFORM IN PHYSICAL PROPERTIES

NECESSITY hastens many a discovery. When deep drilling in the oil industry created the need of extra-heavy, extra-durable drill collars, their service requirements and economical construction presented some new machine-shop problems. Among them was the finding of a steel which could be heat treated in long, massive chunks (sometimes 8 tons and 40 to 50 feet long) to produce uniform high physical properties and yet be readily machinable.

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VIEWING Foundry Developments AT SHORT RANGE

RAPID method of determining moisture in clay eliminates long oven drying period at 110 degrees Cent. by depending upon the chemical reaction between calcium carbide and water. For moisture contents up to 10 per cent the determination is completed in 5 minutes. Procedure involves 100 gram sample of clay to which separately weighed calcium carbide equal to approximately 2½ times the percentage of moisture is added slowly; rubbing the two substances together carefully with a spatula so as not to lose any of the weighed material. After all carbide is added the product is weighed. Mixing is continued for one minute, and a second weighing made. Mixing and reweighing are continued until two consecutive weighings agree.

* * *

It is claimed that distinction between stainless steel scrap and monel metal scrap may be obtained by subjecting the surfaces to the action of a few drops of fuming nitric acid. If the action of the acid results in a bright green froth, the metal is monel while if only a rusty brown color is developed, the material is stainless steel.

* * *

In one foundry employing a skip hoist for charging the cupola, a duplicate control system of wiring and switches was installed so that in case of failure of one system, the other could be used, and thus eliminate any cessation of operations.

* * *

A fine sandblast finish on aluminum alloy castings may be obtained by using a mixture of 4 parts of 100 to 200 mesh silica sand and 1 part of 40 to 80 mesh sand. The coarser sand prevents clogging the nozzle and has no detrimental effect. Size of nozzle may be ¼ x 5 inches or ⅜ x 3 inches, and the air pressure may range from 30 to 75 pounds per square inch.

* * *

One of the leading truck manufacturers employs an alloy iron for its cylinder heads which has the following composition: Silicon, 1.50 to 1.60 per cent; nickel, 2.0 to 2.5 per cent; chromium, 0.30 per cent, maximum; manganese, 0.50 to 0.80 per cent, and total carbon, 2.90 to 3.30 per cent. The cylinder heads are heat treated to relieve any stresses.

* * *

POINTS to be borne in mind to insure sound castings in nickel silver, according to an English authority, are to use raw material of adequate purity and appropriate composition; melt rapidly under slightly oxidizing conditions; do not use charcoal as a cover, but use manganese ore (3 to 5 per cent of the charge weight); deoxidize properly; pour at sufficiently high temperature; fill molds rapidly without excessive turbulence; use ample and properly placed gates and risers; use open sand and vent molds thoroughly, and use moderately soft cores which collapse readily.

* * *

Previous to selection of a cupola blower, a thorough analysis of metallurgical and operating conditions should be made. Maximum pressures and volumes should be established clearly at the beginning. Next average pressure and volume conditions should be studied and assumptions made; arriving at what proportion of the operating time the various pressures and volumes will be required. These should include losses in ducts, valves, bustle pipes, etc. To meet those conditions, the best combination using each type of blower should be considered for capacity, pressure, control, etc. Then the yearly power cost can be calculated. Selection of a particular type of equipment then can be based on installation cost and yearly power consumption.

* * *

Using iron from a green ladle which is poured while the metal is boiling and charged with gas is extremely bad practice, and in the case of thin section castings may lead to production of inverse or inverted chill. Hence, many headaches will be prevented by pigging any iron that boils in the ladle.

* * *

A Southern foundry using cast iron tubes in the upper portion of the cupola to supply preheated air for combustion purposes has installed valves on the tubes so that in case of failure, any tube may be cut out of service until the end of the heat when it is removed and replaced by a new one.

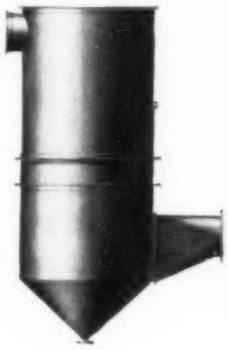
* * *

ONE of the latest innovations in residential heating eliminates the usual furnace and employs instead a fireplace which is fitted with a special unit involving numerous castings in its construction. Heat from the coals in the fireplace is reflected against and passes over the unit through which air is forced by a blower. The heated air then is conveyed in ducts to other rooms in the house. Arrangement of the unit is such that it looks like the ordinary fireplace. Numerous castings are employed in building the unit.

A TYPE AND SIZE FOR EVERY NEED!

This is Page 57

Schneible Multi-Wash Dust Collectors are made in types and sizes to suit the needs of every dust and fume suppression problem. Small units for cleaning up a single dirty operation; large units to handle dirty air from complete foundries; and intermediate sizes for coping with any dirty air and fume conditions. No matter what the air clean-up job may be, there's a Schneible Multi-Wash Collector just suited—a low cost unit that's guaranteed for 5 years against repairs.



JUNIOR COLLECTORS—Made for use where a simple, low cost dust collector is needed, Junior Multi-Wash Collectors have the same design and operating advantages as the Senior Line.

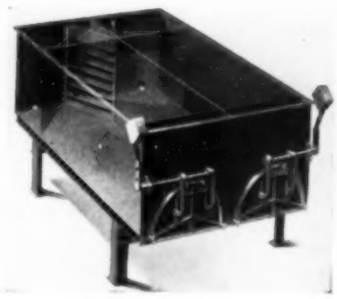
Developed a short time ago to cope with the demands for a collector for single function operations, they are already widely used for controlling dust, gases and fumes; and have proved themselves worthy of their name. Schneible Junior Multi-Wash Collectors are made in all sizes from 1,000 to 30,000 c.f.m. capacity, and are so arranged that they can be changed over into Senior Collectors if desired at a later date by simply adding an additional center impingement plate section.

They are made entirely of metal; have no dead zones or pockets; no parts to clog, burn, wear or become inoperative; are non-freezing; and fully guaranteed for five years against repairs. Send for descriptive Bulletin No. 68.

SENIOR COLLECTORS — Over 500 installations made during the last few years witness the ready acceptance accorded Schneible Multi-Wash Dust Collectors—one user employs more than 70. Repeat orders account for almost 50% of our output! Low cost operation, highest efficiency, and no maintenance are the reasons for this complete user approval.

Senior Multi-Wash Dust and Fume Collectors are made in all sizes from 1,000 to 30,000 c.f.m. capacity in three models; a line so complete that every foundry dust problem is easily solved with a standard unit. They feature labor-free operation; a five-year guarantee against repair costs; nothing to break, burn or wear; no pockets or dead zones; no nozzles, spray heads or moving parts; unaffected by heat, cold or moisture; non-freezing. The complete story is contained in Bulletin No. 110.

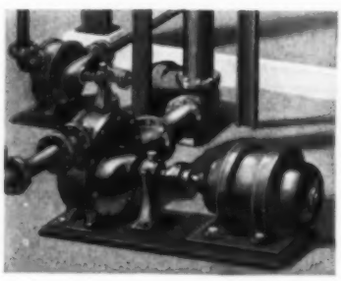
MULTI-LOUVER DE-WATERING TANKS—The simple solution of sludge and water handling and the recovery of circulating water from Schneible Multi-Wash Dust Collector Systems is the Multi-Louver Dewatering Tank.



Made in three types: Rectangular Type for small to medium size installations; Truck Type for medium to large installations; and Concrete Tank Type for large operations — each features simple operation and minimized costs.

Briefly, water and sludge from the Collector Tower is piped into a Multi-Louver Dewatering Tank where the sludge is precipitated and drained for disposal, and the water collected and returned to the system for re-use. They are extremely simple, fast and efficient. Send for descriptive Bulletin No. 337.

See our exhibit • Booths 1 and 2, Block E-8 • A. F. A. Convention at Cleveland • May 14th to 19th



"WEAR-PROOF" PUMPS—To facilitate the handling of sludge and circulating water in Multi-Wash Collection Systems, the "Wear-Proof" Pump has been developed.

"Wear-Proof" Pumps feature long time service under the most abrasive operating conditions; renewable "V" block linings; high operating efficiency; and easy re-packing. Made in seven sizes with G.P.M. capacities from 25 to 500. Linings are available of various materials depending on the abrasive nature of sludge to be handled, and re-lining is quickly accomplished by removing one side of shell and slipping the new "V" blocks into place.

Pump installations can be made directly below Collectors, and close to or away from the equipment they serve; there being, within reason, no limit to the distance that sludge or water can be pumped. For convenience, most installations are located in out-of-the-way places where space is not at a premium. Send for descriptive Bulletin.

CLAUDE B. SCHNEIBLE CO.

DUST SUPPRESSION ENGINEERS

3951 LAWRENCE AVENUE, CHICAGO OFFICES IN PRINCIPAL CITIES

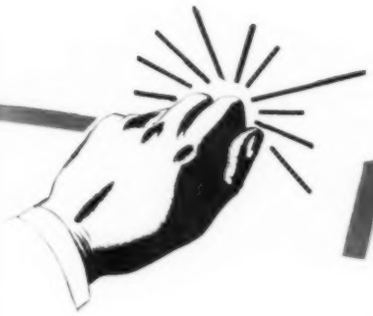
OPPORTUNITY

Opportunity . . . for those who sell the foundry industry! Two great issues of THE FOUNDRY . . . two opportunities to capture for your sales story all of the added interest in foundry equipment, materials and methods which convention-time so definitely brings forth.

■ IF THE FOUNDRY INDUSTRY IS ONE OF YOUR MAJOR MARKETS, your advertising sales message should be in both of these important issues, keynoting your contribution to greater foundry efficiency. By themselves, these two issues are no substitute for the constructive selling-job which only a continuous advertising program will provide, but they WILL most effectively amplify your present and future sales program in a timely, forceful manner.

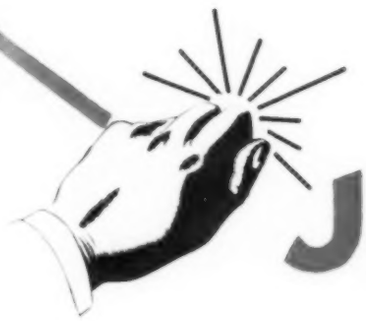
■ IS THE FOUNDRY INDUSTRY ONE OF YOUR MANY MARKETS? If so, you will be well-repaid if you let these two great issues assist you to capitalize on the high-point of interest which prevails at convention-time. These issues are not short-cuts to selling the foundry industry . . . but for the advertiser who must necessarily spread promotion expenditure over many markets, the Pre and Post-Convention issues of THE FOUNDRY are ideally suited.

KNOCKS TWICE



MAY PRE-CONVENTION ISSUE

The keen interest with which this issue is read, due to its comprehensive previewing of the foundry show, gives the advertiser access to a widespread, alert reader-audience. Foundrymen attend their annual convention with very definite plans for the purchase of needed equipment and supplies. The considerable number of SOLD signs which dot exhibited equipment on closing day . . . the business written on models advertised prior to the convention . . . all testify to the power for influencing sales so characteristic of this great issue.



JUNE POST-CONVENTION ISSUE

To the "stay-at-homes", this issue will be the convention itself, and to those who attended the Cleveland Show . . . a welcomed report and review of all that transpired. In the Post-Convention issue, the advertiser can broadcast to the entire foundry industry the sales points and impressions made in Cleveland. The JUNE issue of THE FOUNDRY affords those who do not exhibit the opportunity to relate the sales story an exhibit might have told at the convention itself. In short, an advertising, sales-making opportunity!

THE FOUNDRY

CLEVELAND

Reading

REGULAR meeting of the Reading Foundrymen's association, held at the Wyomissing club, Reading, Pa., on Feb. 15, was devoted to a discussion of "Recent Progress in Alloy Cast Iron."

J. S. Vanick, International Nickel Co., New York, outlined recent developments in application and production of alloys. He described cast iron as one of the earliest of metals whose production, until less than 50 years ago, followed empirical formulas and fracture test methods for guidance of mixing and melting practices. A recent compilation of physical specifications for all types of cast iron, which was prepared jointly by the American Foundrymen's association and the American Society for Testing Materials, struck from the foundry industry shackles which might have delayed its progress 50 years longer.

Mr. Vanick said that a revival of interest in cast iron came with the use of alloying metals: Nickel, copper, manganese, chromium, molybdenum, titanium, vanadium, aluminum, and others. He stated a summary of properties of alloyed cast irons soon will be made available through the facilities of the American Foundrymen's association to all its members.

Improved cupola practice has made possible production of alloy cast irons with high tensile strengths of more than 40,000, 50,000, 60,000, 70,000, and even 80,000 pounds per square inch. High tensile strengths are accompanied by corresponding improvements in other properties; in the fatigue, impact, stiffness, etc. These improvements in cast iron are concurrent with increased strengths, whereas in steels and many other materials high strengths are achieved at the sacrifice of toughness, impact, and other desirable properties.

Mr. Vanick said that the use of appropriate alloy combinations made possible the choice of high uniformity in physical properties throughout heavy sections when desired. In other castings, it makes possible the employment of iron with a gradual depreciation in hardness and strengths from surface to core with an increase in toughness at the core.

Mr. Vanick stressed the importance of machinability in castings which require smooth rapid machining. He described the use of heat treating to increase tensile strength or brinell hardness. He concluded his speech with a brief description of certain alloy cast irons which are particularly resistant to heat, corrosion, wear, scuffing and seizing.—*H. C. Cummings, secretary.*

Seattle

NORTHWEST Chapter of the Gray Iron Founders society, acted as host at a dinner of the foundry industry of Seattle and vicinity, at the Frye hotel, Seattle, on Tuesday evening, March 8. The occasion was a special meeting called to present L. P. Robinson, sales manager, Werner G. Smith Co., Cleveland, who gave an intensely interesting discourse on "Core Room Troubles."

The meeting was attended by approximately 75 enthusiastic listeners representing both the management as well as the operating personnel of local foundries. Mr. Robinson's presentation was directed toward the idea of exacting control of all elements that enter into the production of satisfactory dry sand cores. His remarks were especially thought provoking in that he called upon his vast experience for illustrations of the manner in which many apparently perplexing difficulties can be met and solved. The discussion following his talk was joined liberally by those present with the result that many items and problems peculiar to the particular circumstances were analyzed and the proper method of procedure developed.—*Gilbert Schaller.*

Buffalo

AT THE March 7 meeting of the Buffalo Chapter of the American Foundrymen's association, held in the King Arthur's Restaurant, with T. H. Burke, Otis Elevator Co., and chairman of the chapter, presiding, Frederick G. Sefing, research laboratory, International Nickel Co., Bayonne, N. J., presented a paper on "Factors Affecting Production of Cupola Alloy Iron." Copies of the paper were distributed to the members in advance to facilitate a closer following of the subject and if necessary to check points to be elaborated upon later during the discussion period.

In orderly sequence the speaker developed his theme from the following points: Design and service requirements related to the chemical and physical properties and metallurgical structure; chemical analysis; cupola practice; use of chill tests; tapping and ladles; ladle additions; alloy additions.

Touching on this last feature the speaker pointed out that no alloy is a panacea to make good cast iron from poor iron. A good base iron is essential. On the question of pouring temperature he claimed that high pouring temperatures, 2600 to 2725 degrees Fahr., produce more dense and uniform irons with less tendency toward dendritic structure. Heavy and light sections should be poured with hot iron. Iron poured at 2700 degrees Fahr., will show an increase of 10,000 pounds per square inch in tensile strength over the same iron poured at 2400 degrees Fahr.

On the subject of alloy additions Mr. Sefing does not favor addition of over 2 per cent in the ladle. Larger amounts should be charged in the cupola. In considerable detail he explained the resulting ef-

(*Continued on page* 62)

Management's preference for Hermans is similar to labor's . . . both profit by the use of this machine; management through increased production and lowered costs; labor through increased production and simplification of operation.

Mold quality, and as a result, casting quality, is improved and those "tough jobs" on other machines are easily made on Hermans. Production is increased from two to three times and we have record of even greater increases. Instances where installations have paid for themselves out of profits within a few months are common.

Herman Molding Machines are built in all sizes and capacities for small, medium, and large work. Have one of our engineers call and show you what Hermans will do in your foundry. No obligation, of course.

Earn a profit on that next job . . . Make it on a HERMAN!

MOLDING HERMAN MACHINES

HERMAN PNEUMATIC MACHINE CO., UNION BANK BUILDING, PITTSBURGH, PA.

(*Continued from page* 60)

fects when the following alloys are added to the gray iron base mixture: Silicon, nickel, chromium, molybdenum, manganese, copper, titanium, vanadium, aluminum.

J. R. Wark, Secretary

Northern Iowa

FEBRUARY meeting of the Northern Iowa Foundrymen's association was held at Neeley's Cupboard, Waterloo, Iowa, on Feb. 22. R. G. McElwee, Vanadium Corp., Detroit, Mich, spoke on the use of alloying metals in cast iron.

Mr. McElwee explained that one metal may be added to iron to soften, while another may be used to harden it. The result is not neutralization, but a metal more machineable and stronger. Silicon, nickel, and copper are the principal softeners; chromium, molybdenum and vanadium are most widely used as hardening elements. Proper use of deoxidizers, Mr. McElwee said, increases the strength of metal. Removal of oxygen and other gases included in molten iron widens the range of machineability and strength, without using a high percentage of alloy metals.

St. Louis

BOTH February and March meetings of the St. Louis District Chapter of the A. F. A. were characterized by a continued increase in attendance as well as improved interest on the part of the membership and chapter activities. At the February meeting held at the York hotel, 75 were present.

Various committee reports as presented indicated considerable activity on the part of the members. Apprentice training committee report by C. R. Culling directed special attention to the present foundry class meeting held at the David Rankin school on Wednesday evenings. This class is made up of young men interested in various phases of foundry practice such as molding, pattern making, cupola practice, etc. and its aim is to bring out certain phases of these activities that would be particularly interesting to the class.

The speaker at the February meeting was George A. T. Long, Pickands, Mather & Co., Chicago, who presented a complete and comprehensive talk on "Cupola Practice", outlining methods, operations and installations of the cupola as well as reporting experiences of others in cupola practice. Mr. Long's many years of application well qualified him to present the many facts that he did and to lead in the round-table discussion that followed.

The meeting held March 10 was designated as a "Steel Meeting" and likewise was well attended. Chairman Haley opened the meeting with an introduction of various visitors that were present during the evening and the introduction was followed by the committee reports. These reports were of extreme interest.

The apprentice training committee, C. R. Culling, Chairman, directed attention to the apprentice contest to be judged at the Cleveland convention. He advised that various members secure the details from the committee.

R. K. Durkan, chairman membership committee, introduced three new members, namely, W. F. McKee, Key Co., Julius A. Kayser, Laclede-Christy Clay Products Co., and C. C. Morgan, Bronzoid Corp. Total membership of the chapter now is 75.

Following the reading of the minutes and the Treasurer's report, the Chairman announced the appointment of the transportation committee to handle the Cleveland convention — this committee being Messrs. J. W. Kelin, Chairman, with H. Goodwin and L. E. Everett.

L. E. Everett then introduced the speaker of the evening, A. W. Gregg, Whiting Corp. and Chairman of the membership committee, Chicago Chapter of the A. F. A. Mr. Gregg gave a preliminary talk on various phases of A. F. A. work.

He then spoke on "Steel" — the subject being interesting to the large group. There was considerable round-table discussion afterwards, and Mr. Gregg brought out many interesting experiences and practices that were of keen interest to those in attendance.—*John W. Kelin, secretary.*

Connecticut

CONNECTICUT Foundrymen's association recently elected George R. Holmes, McLagon Foundry Co., New Haven, Conn., as president and treasurer, and Norman Stringer, Charles Parker Co., Meriden, Conn., secretary. The board of directors consists of the following: Henry Washburn, Plainville Casting Co., Plainville, Conn.; Carl Neumann, Union Mfg. Co., New Britain, Conn.; William J. Maton, Waterbury Farrel Foundry & Machine Co., Waterbury, Conn.; James Coltman, Bullard Co., Bridgeport, Conn.; Albert Spencer, Union Mfg. Co., New Britain, Conn.; Edgar Spencer, Philbrick, Booth & Spencer Inc., Hartford, Conn.; and Charles Parker, Charles Parker Co., Meriden, Conn.; George R. Holmes, and Norman Stringer.

Detroit

ALLOY cast irons comprised the subject material for an address by A. L. Boegehold, head of metallurgical department, Research institute, General Motors Corp., Detroit, at the February meeting of the Detroit chapter of the American Foundrymen's association held Feb. 17 at the Fort Shelby hotel, with approximately 100 in attendance.

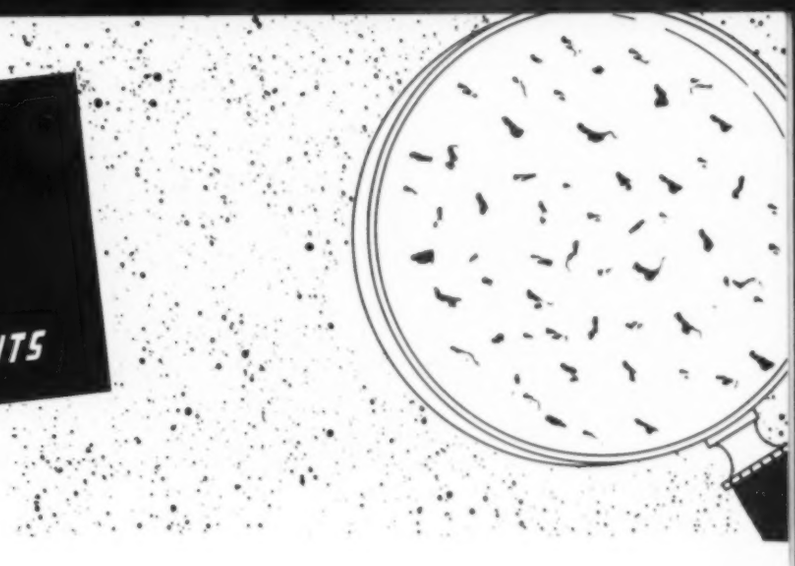
Preceding Mr. Boegehold's presentation were four roundtable discussions on phases of foundry practice. Harry Rayner, Dodge division, Chrysler Corp., led a discussion on cupola operations; J. H. Crawley, foundry superintendent, Pontiac Motor division of General Motors Corp., dealt with gray iron molding and coremaking; Fred S. Walls, International Nickel Co. Inc., Detroit, directed attention to hardeners and

(*Continued on page* 64)

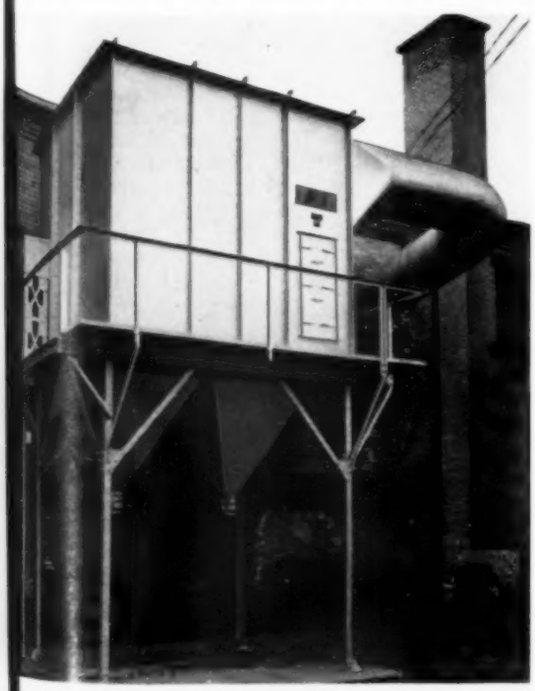
Members and guests of the Detroit Chapter of the A.F.A. at the regular meeting which was held on Feb. 17 at the Fort Shelby hotel. A. L. Boegehold was the speaker and R. Blair Crawford presided

DUST

A Resistance Against Production Profits



...stove unit filters air exhausted from a blast room. Fan is lo-...t inside of the building. The large pipe connects fan and filter.



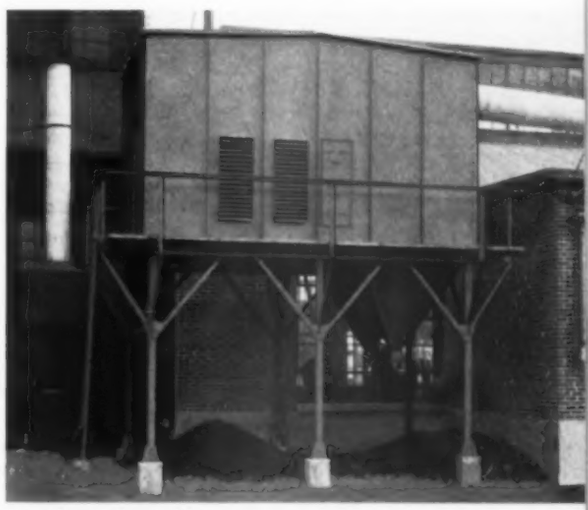
...shown in this cut filters air from a blast room. Exhaust fan ...e of the building. Note ladder which was furnished for easy ...s to the filter and periodic lubrication of shaker motor.

In many cases the existence of dust in plant operations is not apparent. Invisible dust resists production profits and attacks these profits through workmen and machines.

If Dust Exists, Profits are Effected . . .

Let Sly Engineering experience and research check your dust problem.

The Three Cuts show recent installations of Sly flat cloth bag filters which have eliminated purchaser's dust problems—definitely, economically.



This filter is divided by a partition into two filtering sections with separate exhaust fans. One section filters air from a blast room, second section filters air from tumbling mills and grinders. Fan house on the clean air side of the filter. Air exhausted by fans escapes through the fan house louvres.

THE W·W SLY MFG·CO·CLEVELAND·OHIO

(*Continued from page 62*)

softeners for cast iron; and J. W. Collins, Aluminum Co. of America, Detroit, took charge of the round-table on nonferrous molding and melting.

Defining alloy cast iron as a cast iron to which sufficient alloy addition has been made to produce an appreciable change in properties in the size section for which the iron is to be used, Mr. Boegehold pointed out that physical properties are reflections of the microstructure which in turn is governed by the amount of iron carbide (Fe_3C) which has decomposed.

Cooling rate was likened to a valve which determines how far this decomposition proceeds, and the various alloying elements contribute either to the stabilization or destabilization of the iron carbide. Thus each alloy may be considered to have a certain "graphitizing pressure." In general there are two classes of alloys—one which tends toward stabilization of carbide or chill producing, and the other tending toward destabilizing carbide formation or chill restraining.

In the first class are such alloys as vanadium, chromium, molybdenum, etc.; in the second such materials as copper, nickel, aluminum, etc. Mr. Boegehold presented slides illustrating the effects of the various alloys on microstructures and physical properties.

In summation, alloys exert three main effects on physical properties —stabilizing or destabilizing the carbide; regulation of graphite structure, and control of matrix.—*A. H. Allen.*

Metropolitan

APPROXIMATELY 75 were present to hear Sam Tour, vice president, Lucius Pitkin Inc., New York, discuss "Nonferrous Casting Defects—Their Causes and Cures" at the second monthly meeting of the metropolitan chapter of the American Foundrymen's association at the Essex House, Monday evening, Feb. 21.

Mr. Tour enumerated 22 defects which he believed were most common in nonferrous castings and itemized 10 probable causes as being likely to have a bearing one way or another. To facilitate discussion, the speaker compiled a chart covering these defects and probable causes.

Donald J. Reese, chairman of the newly organized chapter, who presided, declared that in his opinion Mr. Tour's chart applies almost equally to steel, malleable and gray iron, as well as nonferrous castings.

The chairman announced that Samuel Frankel, Howard Kramer & Co., New York, has been named treasurer, W. A. Phair, associate editor, *Iron Age*, New York, has been elected to the directorate, which now comprises four members. Terms of present officers and directors expire June 30, which is the end of the fiscal year for the American Foundrymen's association and its affiliates.

Federick G. Sefing, International Nickel Co., Bayonne, N. J., and chairman of the by-laws committee, which is also comprised of N. A. Kahn, Brooklyn navy yard, Mr. Clark, Crucible Steel Co. of America, New York, and Earnshaw Cook, American Brake Shoe & Foundry Co., New York, presented by-laws for the approval of the members.

Mr. Sefing said the committee had left one point open and that pertained to the number of directors and the manner in which they should be elected. He suggested that this matter for the moment be left to the discretion of the board of directors.

The report was approved along with the committee's suggestion with respect to the directors. Mr. Sefing pointed out, incidentally, that the area covered by the chapter included New York city and Long Island and Northern New Jersey as far south as Trenton and Phillipsburg, but not including these two cities. These cities, he added, came under the jurisdiction of the Philadelphia chapter.

Chairman of the Philadelphia chapter, Harold Henszey, Carborundum Co., Philadelphia, was a guest, who spoke briefly of the activities in his district. The Philadelphia chapter was organized about 3 years ago, the group prior to that comprising the Philadelphia Foundrymen's association.

Mr. Tour described defects and the manner in which various probable causes operate. These causes, he said, may be due to design, pattern equipment, mold setting, gating, molding, molding sand, cores, metal, melting and pouring. In the case of one defect, which he referred to as "shift, a mismatch of the cope and drag at the parting line," there was only one probable cause, namely, pattern equipment.

In the case of another defect, which represented the other extreme in point of the number of possible causes, he enumerated as many as seven which might have some bearing. This particular defect he described as "cold shut a lack of joining of steel where two streams met, leaving an apparent crack or weakness which may result in a crack." In the order of their importance he mentioned gating, pouring, mold setting, molding sand, molding, melting, and metal as likely to have some bearing in this case.

In addition to shift and cold shut, Mr. Tour listed the other likely defects, briefly, as follows: Shrinkage cracks and cavities, fins or strains, variation of all thickness, "wormy" surface, crush, swell, sand wash, scab, sand blow, core blow, and sand sticking in core cavities. Also surface stains, burning into the sand, burning into cores, weak or interrupted structures, rough or pitted surface, gas holes, tin or lead sweat, solid inclusions and misruns.—*B. K. Price.*

Pittsburgh

ALL FERROUS castings are of one large family, and differ only in amount and form of carbon present, stated H. A. Schwartz, metallurgist, National Malleable & Steel Casting Co., Cleveland, speaking before the regular February meeting of the Pittsburgh Foundrymen's association. The meeting, held Monday, Feb. 21, was attended by approximately 75 foundrymen and guests.

Steel, malleable, pearlitic malleable, gray and white cast irons are all of the same basic structure and if the amount of free and combined carbon is known as well as the form in which graphite is present, the general properties of the casting may be determined. Following heat treatments then govern distribution of these as to form, according to Mr. Schwartz.

Chairman of the active discussion which followed was R. C. Heaslett, chief metallurgist, Continental Roll & Steel Foundry Co., Pittsburgh. H. M. Wilson, Taylor-Wilson Mfg. Co., Pittsburgh, and president, Pittsburgh Foundrymen's association, was chairman of the meeting. *R. L. Hartford.*

Southern California

REGULAR meeting of the Southern California Chapter of the American Foundrymen's association was held Feb. 24 at the Clark hotel, Los Angeles. Gorden L. von Planck, metallurgist, Columbia Steel Co., San Francisco, presented an interesting discussion on "Production of Pig Iron in the West."

Mr. von Planck discussed the early attempts to produce pig iron in the West, emphasizing the plant which now is operating at Provo, Utah. He pointed out the advantages of pig iron to the foundryman who needs accurate control and uniformity of operation to produce the new types of high strength and alloy castings. The balanced blast cupola was mentioned as a recent development.

J. G. Coffman, Los Angeles Steel Casting Co., vice chairman of the chapter, reported that C. J. P. Hoehn, Enterprise Foundry Co., San Francisco, chairman of the Northern California chapter, had

(*Continued on page 67*)

(*Continued from page* 64)
awarded the baby gavel to the Southern California chapter. Mr. Coffman presented this token to Chairman Robert Gregg, Reliance Regulator Corp. The baby gavel originally came from the American Foundrymen's association headquarters at Chicago.—*L. O. Hofstetter, secretary.*

New Jersey

NEW Jersey Foundrymen's association held its regular monthly meeting at the Downtown club, Newark, on Feb. 23. Approximately 90 foundrymen attended. After the dinner, former President Walter H. Cole gave a short talk congratulating President William P. Laytham on continued progress of the association in building up a spirit of unity and co-operation among New Jersey foundries.

Speaking on "Refining Cast Iron" George S. Evans, metallurgist, Mathieson Alkali Works, New York, described modern technique in desulpherizing cupola metal and the advantages of the process. After tracing the history of desulphurizing, Mr. Evans centered his remarks on the application of fused sodium carbonate, which he commonly referred to as purite. He said the particular values as a refining agent for cast iron are its power to form highly active, fluid slags at cupola melting temperatures, and the rapidity of the reactions within the slag at these temperatures. Such properties make it possible to refine the metal from the cupola spout within time limits and temperature losses allowable in average foundry operations.

Practical usage, Mr. Evans said, has established the economic value of fused sodium carbonate in the cupola for improving combustion and for influxing entrained oxide-silicon inclusions which sometimes show as hard spots in light section castings. Percentage of scrap can be increased in most cases with use of sodium carbonate in the cupola. However, he added, where a high scrap mixture is used in the production of castings that require machining, or where sulphur must be held within specified limits, the combined use of small quantities in the cupola coupled with desulphurizing in a teapot mixing ladle generally is to be preferred.

He stressed the importance of special equipment and procedure and mentioned the continuance process of refining which overcomes the original difficulties in the adoption of soda ash refining by the foundry industry. This process, he said, provides for the continual maintenance of an active refining slag on a bath of molten iron and the drawing off of the refined iron from the bottom. By this system, variations in composition between different parts of the heat generally are leveled out by the better mixture in the refining reservoirs and the effects of the refining. The process can be carried out in either a forehearth or a teapot ladle.

The capacity of the mixer ladle, Mr. Evans said, may vary widely for the same diameter cupola, depending upon the class of work, the capacity of the transfer ladle and the extent of desulphurizing that is desired. Where practical the ladle should be kept nearly full throughout the entire heat.

Hesitancy in adopting this method of refining, particularly at foundries producing lightweight castings, has been caused by fear of temperature losses in the mixer. This objection has been overcome by the development of elongated teapot mixer ladles, Mr. Evans said. That type of ladle may be U-shaped or cylindrical and it is provided with cover and insulation. Improvements in fluidity in pouring qualities resulting from the refining more than offset any drop in temperature from holding iron in the mixer.

Some reference was made to the production of castings from 100 per cent scrap mixtures. By the use of fused sodium carbonate some excellent results are being obtained. Mr. Evans remarked, however, that the use of such scrap mixtures in the production of specification castings hardly is to be recommended and cited cases where he believed a mixture containing fully 40 per cent pig iron is desirable and is used. He said he mentioned these high scrap mixtures because they illustrated the action of soda slags upon molten cast iron at cupola temperature.—*B. K. Price*

Milwaukee

APPROXIMATELY 60 men attended the regular monthly meeting of the Milwaukee chapter of the American Foundrymen's association, held at the Schroeder hotel, Milwaukee, on Feb. 18. V. M. Hydar, Falk Corp., and chairman of the chapter apprenticeship committee, presided.

Prof. E. R. Shorey, department of metallurgy, University of Wisconsin, Madison, Wis., was introduced and discussed briefly the course in metallurgy being given in Milwaukee by Prof. Oesterle of that department. R. M. Jacobs, Standard Brass Works Inc., and chairman of the chapter vocational guidance committee, reported on the successful beginning of foundry courses in the vocational schools of Oshkosh, Racine, Waukesha, South Milwaukee, West Allis and Milwaukee.

E. G. Borgnis, International Molding Machine Co., who entered into an apprenticeship contract on Nov. 29, 1887, was introduced and gave a brief account of his experiences as a patternmaker's apprentice 50 years ago. Photostatic copies of Mr. Borgnis' original contract were circulated among those present.

Scheduled speakers were J. A. Teepoorten, executive secretary, committee on circuit relations, Wisconsin Vocational schools, who discussed the Wisconsin apprenticeship program, and Martin Wesolowski, circuit instructor, Wisconsin Vocational schools. Mr. Wesolowski outlined a modified apprenticeship plan for malleable foundries and other foundries where a 4 year term of apprenticeship seems impracticable. —*W. J. MacNeill, secretary.*

Conn. Nonferrous

FEBRUARY meeting of the Connecticut Nonferrous Foundrymen's association was held at the Hotel Duncan, New Haven, Conn., on Feb. 15. Approximately 40 members attended the meeting over which H. A. Phelps, Phelps Foundry Co., Ansonia, Conn., and president of the association, presided.

The speaker of the evening was R. W. Reinicke, Chase Brass & Copper Co., Waterbury, Conn., who discussed "Forgings and Pressure Die Castings Versus Sand Castings." He presented some interesting information on the advancement being made in the field of forgings and pressure die castings. President H. A. Phelps has appointed George King, Malleable Iron Fittings Co., Branford, Conn., as chairman in charge of the April meeting.

Connecticut Nonferrous Foundrymen's association held its March monthly meeting at the Hotel Duncan, New Haven, Conn., March 15. H. A. Phelps, Phelps Foundry Co., president of the association, presided at the meeting.

E. Parker Mott, Metal Hose & Tubing Co., Brooklyn, N. Y., spoke on "Modern Furnace Improvements and Refractory Insulations." The speaker discussed his idea of the three main characteristics constituting an ideal furnace for melting brass, bronze and other alloys: First, ability to deliver metal of uniform analysis with equal regularity for each and every heat; second, an endless operating lifetime; third, ability to operate at a minimum cost using a heat medium of a uniformity readily available at all times irrespective of weather conditions.

President Phelps appointed Fred B. Clarke chairman of the entertainment committee and Louis G. Tarantino, S. W. Chappell Jr., F. B. Diana, H. Dingee, W. J. Kenney and T. Joseph Judge members. This committee will arrange for the June entertainment meeting.

Chairman in charge of the next regular meeting to be held April 19 will be George King, Malleable Iron

Fittings Co., Branford, Conn. David Tamor, Reading, Pratt & Cady division, American Chain Co., Hartford, Conn., will be chairman of the May meeting postponed to May 24 due to the American Foundrymen's association convention.—*Louis G. Tarantino, secretary.*

Northern California

NORTHERN California chapter of the American Foundrymen's association held a very successful meeting at the Athens Athletic club, Oakland, Calif., March 11. Plans were made for a statewide meeting of California foundrymen to be held about the middle of April.

Speaker for the evening was L. P. Robinson, Werner G. Smith Co., Cleveland. Mr. Robinson spoke on "Core Room Problems" and his careful and interesting diagnosis of that feature of the trade was of great help to those present. Mr. Robinson stopped a few days in San Francisco, having last visited with the foundrymen in the Northwest. After leaving San Francisco he was scheduled to speak before the Southern California chapter. While in southern California, Mr. Robinson will attend the Western Metals congress.—*George L. Kennard, secretary.*

Philadelphia

PHILADELPHIA Chapter of the A.F.A. had another fine turn-out, over 200, at the technical meeting held at the Engineers club Friday, March 11. One hundred twenty-five members and guests sat down to dinner at 6.30 p.m. and then listened to a talk on "Hunting in the Canadian Rockies" by Clarence Ederer, vice-president, R. J. Ederer Co., Chicago. Mr. Ederer showed movies of his recent hunting trip in the wilds of Canada. Chairman Harold Henszey complimented the chapter on the fine attendance and read a telegram just received from Bill Coleman, our secretary-treasurer, who had just arrived on the west coast after his trip to Hawaii.

Harold J. Roast, vice-president, Canadian Bronze Co., Montreal, was presented by Dr. G. H. Clamer. Mr. Roast's paper was "Honesty in the Foundry Business." Everyone was just a little puzzled how Mr. Roast would treat this delicate subject—one seldom if ever under discussion at a technical meeting. Mr. Roast certainly knew his subject and was not afraid of his audience and he delved into dictionary meanings of both "honesty" and "business" and cited the need of both and the temptations to be dishonest as they affect the boy in the foundry who stamps heat numbers on castings, to the molder, foreman, superintendent, the chemist and metallurgist, etc.—yes, even sales manager, president and board of directors.

The purchasing agent must be honest and when he specifies an alloy to be made from virgin metals, he should not give the business to anyone who quotes a price less than the cost of virgin metals—let alone the cost of manufacture. The purchasing agent likewise must know when virgin metals actually are needed. The designing engineer must be fair in his design and see that it is of such a nature to be properly carried out at a fair and reasonable cost by the final manufacturer. In the foundry it also holds good that the treasurer be honest so that fair credits are given where due and if a cost price is given to a customer, then these costs should not be loaded up just because work is taken on a cost plus basis. All through his paper, Mr. Roast referred to quotations including the Bhagarad-Gita translation from the Hindu, the Koran, Emerson, Ruskin, Lowell and others.

It was a most interesting paper and the large audience certainly took home with them plenty of food for thought. If we could all practice the principles of honesty not only in the foundry business but in all that we do, this would be a much better place to live in.—*J. T. Fegley, chairman publicity committee.*

Northeastern Ohio

NATIONAL Officers night of the Northeastern Ohio chapter of the A. F. A. which was held at the Cleveland club, Cleveland, on March 10 attracted approximately 150 chapter members and guests who greeted Marshall Post, Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa., vice president and president-elect of the A. F. A., and C. E. Hoyt, executive vice president of the association.

Following the dinner, Chairman Bert G. Parker, Youngstown Foundry & Machine Co., Youngstown, O., called upon Mike Thomas, City Foundry Co., and chairman of the membership committee for a report, and he stated that during the past year 25 new members had been obtained. Chairman Parker announced the appointment of a nominating committee comprised of Frank G. Steinebach, editor of THE FOUNDRY, J. J. Witenhafer, Lake City Malleable Co., and Henry J. Trenkamp, Ohio Foundry Co., which will present a slate of officers for the ensuing year at the April meeting.

James G. Goldie, Cleveland Trade school, and chairman of the apprentice training committee spoke briefly on the apprentice contest to be held in connection with the annual convention of the A. F. A. to be held in Cleveland in May, and urged that as many foundries as possible have entries. C. E. Hoyt, executive vice president of the A. F. A. stated that requests from foundry equipment and supply firms for exhibition space, and from individuals all over the country for hotel reservations indicate that the forthcoming convention and exhibition will be the greatest ever staged by the association.

Marshall Post, the main speaker of the evening, then presented a talk on the application of cement-bonded molds to production of ferrous and nonferrous castings. Stressing the point of producing quality castings as well as service to the ultimate consumer, he paid a tribute to the supply men of the industry and their readiness to help solve difficult problems. After a short history of the iron industry in the vicinity of Birdsboro, Mr. Post discussed advantages and disadvantages of dry sand molding for steel castings. He then showed how cement as a bond which is the basis of the Randupson process employed in his foundry, served present day requirements for cleaner and better castings.

The process developed in France, has been in use for about 3 years, and at present all of the miscellaneous work in the Birdsboro plant is produced by the cement-bond mold process. Molds can be made from patterns made for dry sand molding, by the core box method, and if symmetrical, by the sectional method. It was pointed out that if the pattern was designed for the process, in many cases only a half, quarter or even an eighth pattern was necessary.

Advantages claimed for the ment-bond molding process include: Dimensional accuracy due to freedom from mold warpage and distortion because artificial drying is not used; clean surface and accurate pattern outline; molds or cores can be made in the conventional drag-cope method, with core boxes, or by sections; relative freedom from scabs, pinholes and blowholes; flasks are not required except on larger jobs; simple boxes or forms are sufficient; little nailing on steel castings, no nails on small iron jobs, and but few nails on corners or fillets of large iron jobs; no gaggers and relatively few reinforcement rods; no arbors in cores except in large work where simple rail or beam suffices; one type of facing for iron, steel, and nonferrous foundry work.

Mr. Post showed lantern slides to depict a general comparison of specific types of castings made by the dry sand, and by the cement-bond process. He concluded his

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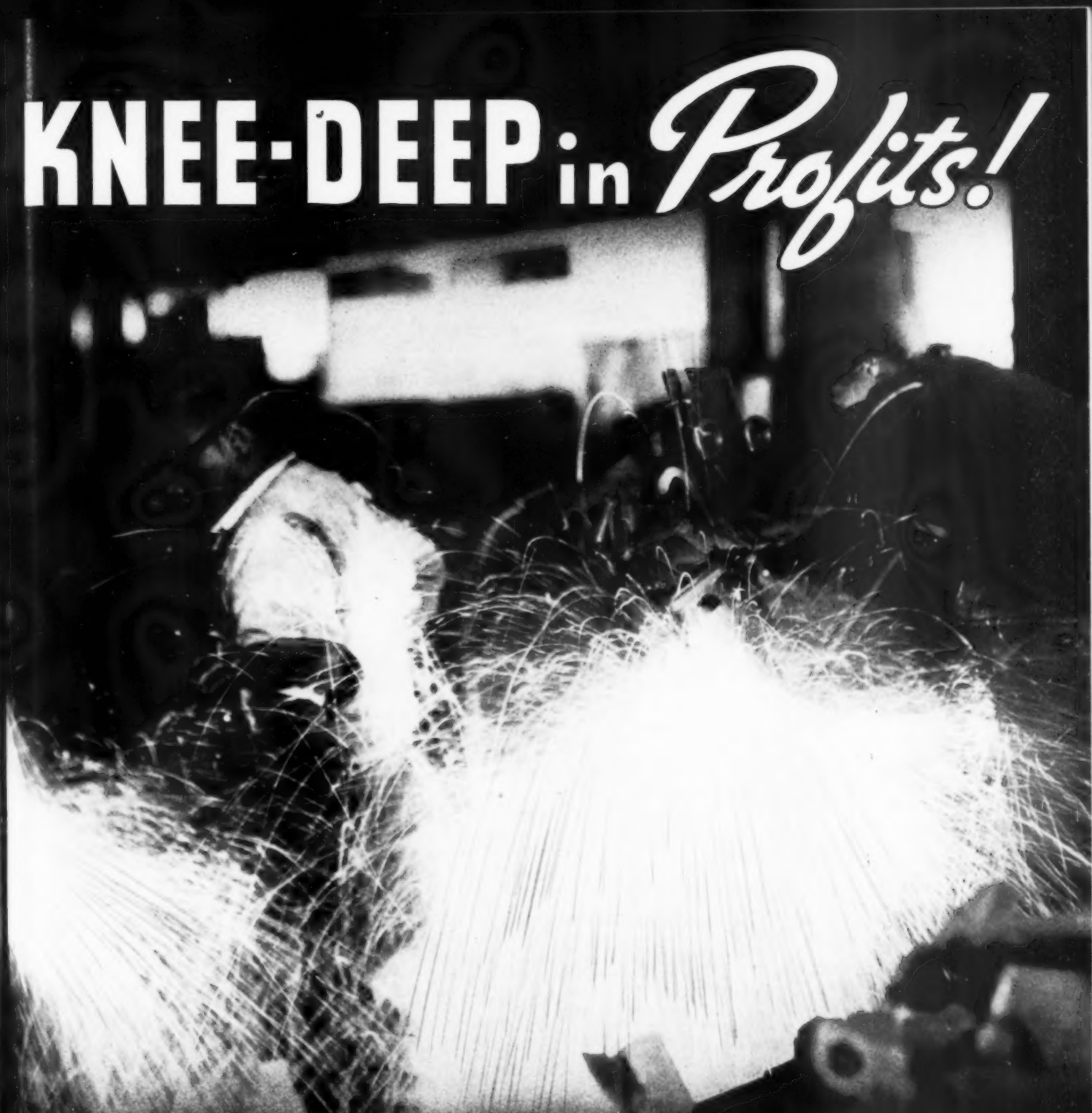
KNEE-DEEP in *Profits!*



IN THE FOUNDRY...sparks are profits! These tough, high-speed U. S. ROYALITE WHEELS are snagging 200,000,000 chips a minute . . . eating up dead metal...taking a big bite out of operating expense . . . cutting down costly time! High-speed U. S. ROYALITE GRINDING WHEELS are strong, fast, and safe! They run cool and last long... that's why they give you—

ROYALITE GRINDING WHEELS

SERVICE BEYOND PRICE AND SPECIFICATIONS

UNITED STATES RUBBER COMPANY · US · TRADE MARK

United States Rubber Company

United States Rubber Products, Inc., New York, N. Y.

Fig. 8—Facing sand is prepared in a muller type mixer. Raw material is dumped into an elevator boot below the floor level, and elevated into the mixer

Customers Are More Particular

(*Continued from page* 26)

share one factor in common. The surface must be clean and smooth. Hence the coal dust in the facing and the close attention paid to the bond, permeability, grain size and strength of the sand.

Practice in the core room is held to the same degree of accuracy. Prints on the patterns and on the coreboxes coincide perfectly and as a result the castings have no unslightly fins from under size cores, no crushed edges from over size cores. The cores fit snugly in the mold prints with a resultant uniform thickness of metal on the upper and lower side. A general view in one section of the core room indicating the wide variety of cores produced daily is shown in Fig. 7. One of the benches, typical of the many located close to the windows is shown in Fig. 1.

An attendant places a supply of core plates on a bench at the coremaker's left. The coremaker makes the cores on the bench containing a supply of sand. The finished cores are placed on a plate at his right. When the plate is filled it is carried to a rack similar to that shown in Fig. 7. The loaded racks are taken by lift truck and placed in a battery of six double door gas fired ovens. The core room is smoothly floored with cement to facilitate movement of the trucks and eliminate vibration.

Majority of the cores are made from a mixture containing 1 barrow load (approximately 120 quarts) sharp sand, 2 quarts core oil and 1 pint coal oil. This is brought to the proper working consistency by the addition of 3 gallons of water. In a second mixture where a higher green bond strength is needed, the same amount of sand is mixed with 1 quart of oil, 6 quarts of flour and 1 pint coal oil. Pin cores, hard, straight little cylinders in which a high permeability is not required are made from a mixture of 3 parts sharp sand, 1 part molding sand bonded with oil in the proportion of 1 part oil to 40 parts sand. Addition of a small amount of coal oil to all these mixtures is claimed to prevent the sand from sticking to the coreboxes.

Interesting detail in connection with the production of cores for ½-inch pipe ells is shown in Fig. 1. The multiple corebox is aluminum, designed to produce two units, or the cores for four castings each time it is filled and emptied. With the two halves of the corebox on the bench in front of him, the coremaker scoops sand with his hands, fills the cavities and pats the sand down. Surplus material is struck off with a small straightedge and then both halves of the box are brought together face to face. The assembled box is placed on the plate at the coremaker's right. The forward half is removed and the second half is employed to slide the cores close to those already on the plate. The second half of the box then is removed and the process repeated as often as necessary.

Obviously a core made in this manner, that is all in one piece has a better chance to be true in size and shape, than where the halves are made and dried separately and then pasted. The small pier in the center of the core serves a double purpose in promotion of accuracy in the finished casting. While the core is still green, the pier prevents it from sagging. After the dried core is placed in the mold, the pier serves as an extra anchor or print to hold the core firmly in position and prevent it from moving under the pressure of iron when the mold is filled. Just the extra little touch that marks the difference between perfection and near perfection.

One of the molds in which these cores are placed is shown in Fig. 4. The molds are made in an aluminum strip type flask on a squeezer molding machine. On an aluminum match plate the patterns are arranged in two single rows on the outside and a double row in the center. Metal is poured into the mold through two sprues and enters the mold cavities through the runners and gates formed in the cope face of the mold. Compact arrangement of patterns and gates to secure maximum production from the mold is shown in that illustration. The pattern plate is set up to show the cope side.

Made in Special Flasks

Malleable iron flasks conforming closely to the contour of the pattern and typified in the flask shown in Fig. 2 are used on special jobs where the volume of orders is fairly constant. The casting made in this mold is for a hydraulic hoist and must conform to close specifications especially in the distance between the center lines of the bearings. Minor variations in this feature are adjusted in a hydraulic press after the castings have been cleaned. and annealed. Practically all the larger castings spring or warp slightly in the first cooling and later in the annealing ovens. Since they are duplicate parts assembled later in outside manufacturing establishments, it is essential that each casting shall conform accurately to dimensions. Two presses are available for the purpose, one of 100 and the other of 500 tons capacity.

The gating system on the mold shown in Fig. 2 includes a skimmer core under each of the two sprues and two shrink bobs, one at either end of each runner. The arrangement is shown clearly on the pattern in the foreground with the drag side exposed. Metal from the sprue falls through the skimmer core into a short runner which rises from under the core and enters the shrink bob cavity. A short, thin gate connects one shrink bob with the side bar of the casting, while the other shrink bob is connected by a similar gate to the side of the bearing. To form an adequate feeding pool of metal, the shrink bob cavity extends into both the drag and the cope parts of the mold.

One section of the foundry floor is set apart for the production of annealing pots as shown in Fig. 6. These are the containers in which

(*Concluded on page* 73)

(*Concluded from page* 70)

the malleable iron castings are packed with sand and placed in the annealing ovens. As cast the malleable iron castings are hard and brittle with a white fracture. Subjected to the proper temperature in the oven the composition of the metal is changed so that the final structure of the metal consists of ferrite (Fe) and free carbon (C) in the form of temper carbon, with substantially no combined carbon in the form of free cementite (Fe_3C) or pearlite (Fe_3C+Fe) present.

After the required number of pots are placed in the oven the door is sealed. Temperature of the oven is raised in 24 hours to 1500 degrees Fahr. It is held between 1500 and 1700 degrees for 60 hours. The temperature then is lowered at a rate of not more than 8 to 10 degrees per hour until it reaches 1200 degrees. From this temperature the temperature is lowered rapidly and the wall is knocked down at between 1100 and 1000 degrees. The pots then are removed, dumped on the floor and after the castings have cooled they are taken to the various cleaning stations.

Under this severe service the annealing pots become warped and crack in a comparatively short time, hence the necessity of keeping up the supply. The pots are molded as shown in a trench filled with molding sand and divided into sections by suitable plates extending from side to side. Thus if the entire number of pots is not cast from any given heat, those that are cast may be lifted out of the molds without disturbing the others. The pots are cast with over iron from the furnace at the close of the heat. Base plates on which the pots are stacked in the ovens are cast in the same manner. Molds for three of these castings appear in the left background Fig. 6.

In the molding section of the foundry the floor is sand, while the longitudinal and transverse gangways are concrete reinforced with malleable iron gratings as shown in Fig. 3.

In addition to the truck loads of various materials in constant transit over the various gangways, the metal from the furnaces is conveyed to all the molding floors in small bull ladles mounted on wheels, as shown in Fig. 9. Metal is poured into the molds from hand ladles and to maintain the necessarily high temperature, each bull ladle holds enough to fill four hand ladles. The bodies and wheels of the bull ladle trucks are malleable iron, machined and assembled in the repair and maintenance shop in the plant. The long, tubular steel shank is supported in two babitted bearings provided with caps for relining and adjustment. Cast collars attached by set screws hold the ladles in proper balanced position. When not in use the ladles are kept at one end of the sand mixing department where an attendant keeps them in repair and relines them when necessary, usually once in two weeks.

In the cleaning room the hard iron castings are cleaned in a battery of tumbling barrels and then loaded into the annealing pots for treatment in the annealing ovens. The annealed or soft iron castings are cleaned by a stream of metal abrasive mechanically driven against the surface in a cleaning device built by the Pangborn Corp., Hagerstown, Md.

Other departments in the plant include a pattern and wood working shop, a metal working shop for repairs and replacement of equipment, a room where a highly skilled molder constantly is engaged in making hard sand matches or follow boards and a well appointed chemical and physical laboratory.

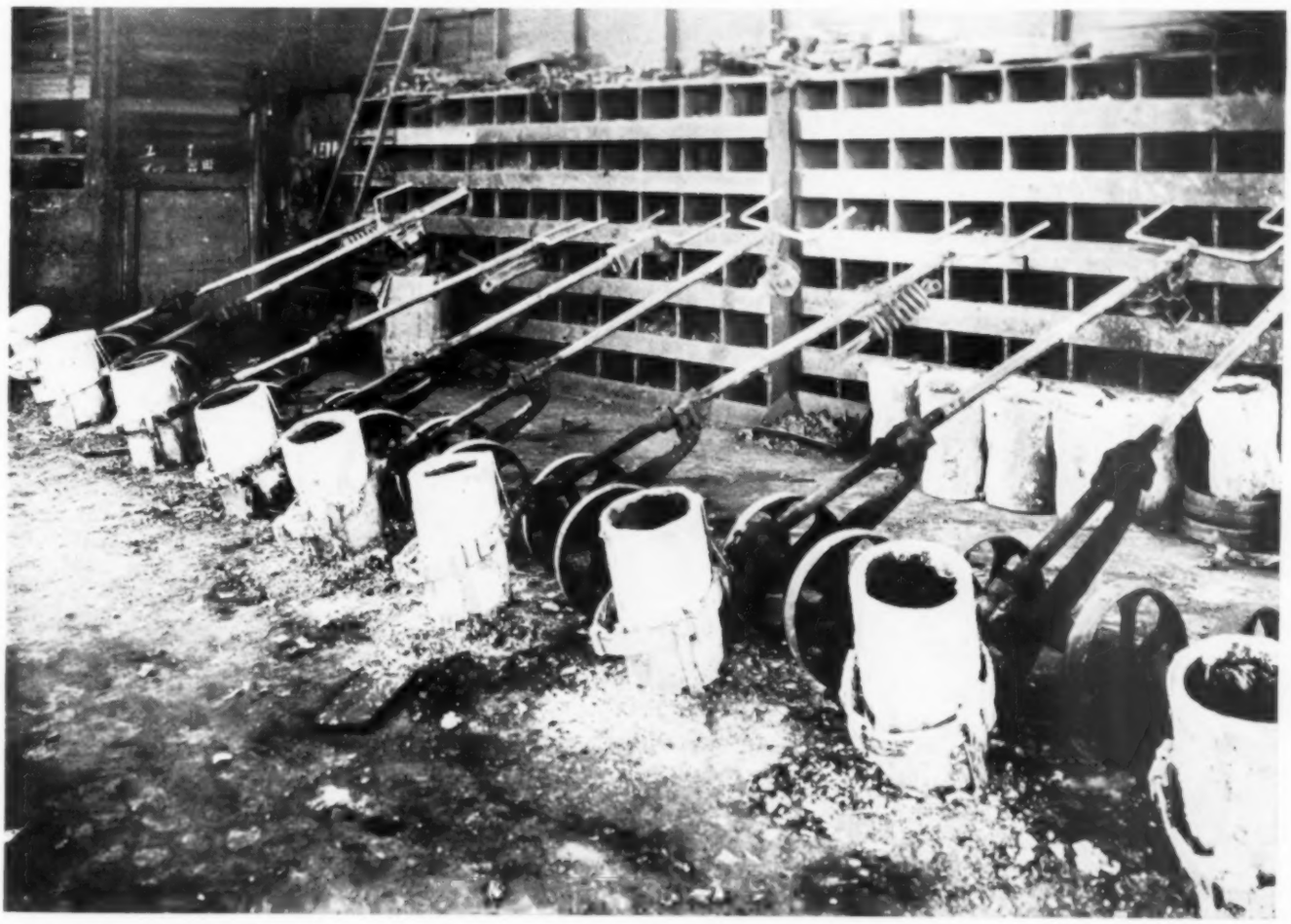


Fig. 9—Molten iron is transported from the furnaces to the floors in small bull ladles mounted on 2-wheeled trucks. Each bull ladle carries enough iron to fill 4 hand pouring ladles

Fig. 6—Cores are baked on racks in carefully controlled oil and gas-fired ovens

Aluminum Foundry Molding

(*Continued from page* 31)

materially by the gating practice.

As a general rule, castings should be gated and fed in such a way as to provide a sequence of solidification which insures an adequate supply of molten metal to feed each section as it solidifies. Such solidification should start at points furthest removed from the gated area and proceed progressively to the risers which provide liquid metal to take care of the shrinkage. Seldom do castings permit the entire fulfillment of these conditions.

Therefore, it is necessary in most cases to establish a compromise in the gating practice which will insure maximum soundness in those sections of the casting requiring the highest strength. Such a compromise often requires the use of chills embedded in the mold to hasten the solidification of the heavier sections. Chills for this purpose may be of aluminum, copper, or cast iron and of such a size as dictated by the dimensions of the casting section.

Multiple gating is recommended for aluminum, that is, the metal should enter the mold cavity at a number of points instead of one or a few as in the case of certain other metals. Such multiple gates permit a lower pouring temperature and through a reduction of the temperature gradient throughout the casting, facilitate the establishment of the desired sequence of solidification.

Gates should be designed and placed on the pattern so as to insure that the metal enters the mold with a minimum of agitation, thereby reducing the formation of dross. Maintaining the cross sectional area of sprues and runners about equal to or slightly smaller than the total area of the gates, aids in fulfilling this requirement. Use of rectangular sprues, pouring basins, and skim gates is often desirable, particularly when using alloys which oxidize readily.

Risers Act as Exits

Risers, in addition to their function as reservoirs of liquid metal to feed the casting as it solidifies, also act as exits for mold gases and oxides, as pressure heads, and as means of reducing the temperature gradient within the casting. To fulfill all these functions satisfactorily, requires a careful study of each pattern to determine where the risers should be placed, how many should be used, and their size.

In many cases, risers cut into the side of a casting rather than on top are more desirable. In such instances the gates should be cut into the risers. This will insure hot metal in the riser, provide additional skimming of the metal as it enters the mold, and prevent the shrinkage

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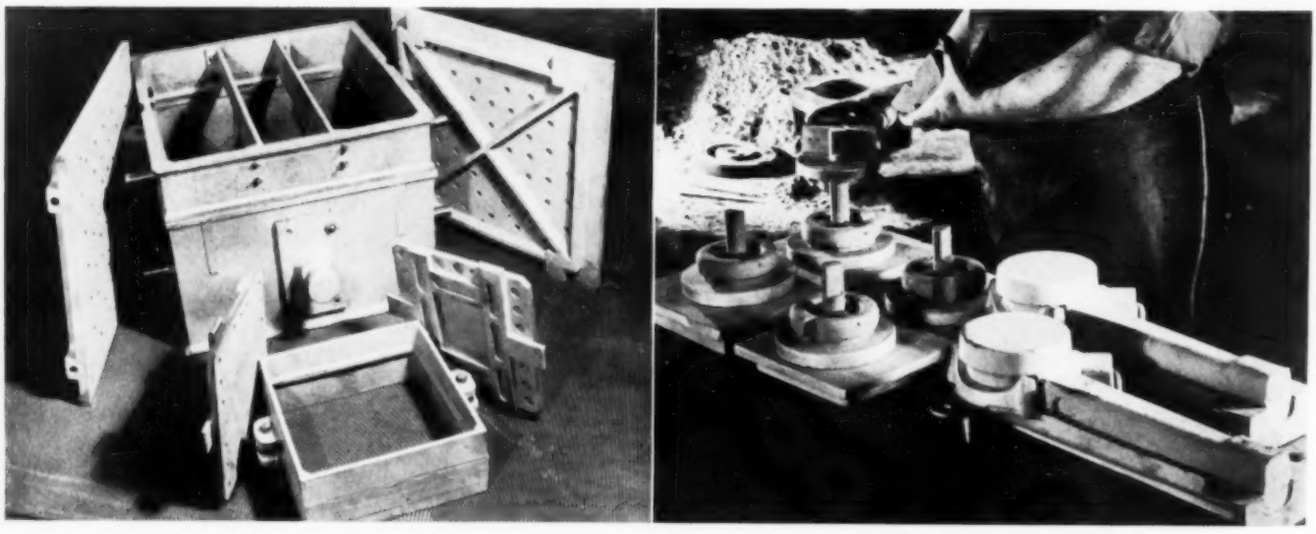

Fig. 7—Cast aluminum alloy flasks and bottom boards facilitate handling of large and small molds. Fig. 8—Green sand cores on cast aluminum alloy plates and driers await removal to drying racks

An old adage says: "No man can serve two masters." Divided allegiance usually results in only *half-way* service to either master.

For 53 years the *only* master which the Woodward Iron Company has served has been the IRON FOUNDRY TRADE. The only master which has dictated its policies has been the *requirements* of the Iron Foundry Trade. With no thought to steel or any product competitive with pig iron, it has concentrated its facilities exclusively on making *better* pig iron.

That is one reason why the Woodward Iron Company enjoys to such a unique degree the confidence of foundrymen. They know that during periods of peak demand, this company will never sacrifice the interests of its customers to serve its own requirements. They recognize that Woodward's independent policies—its unswerving loyalty to a single master—insures trustworthy service on good pig iron at all times and under all conditions.

WOODWARD IRON COMPANY

WOODWARD, ALABAMA

America's Largest Completely Integrated and Entirely Independent Merchant Iron Producer

(*Concluded from page* 74)

sometimes found where the gate enters the casting.

Placing of gates and risers also may be influenced by cleaning considerations and flask equipment. Gates and risers are removed most readily from surfaces which are in relief and unless the casting soundness is impaired, should be placed on such surfaces. Also flask bars should be located so that they are not too close to risers. Close proximity to these bars or other rigid flask parts may restrict the normal contraction of the casting and result in cracks.

Use of risers with a rectangular cross-section and placed so the long axis is parallel to the long axis of the casting is often beneficial in such cases. In other cases, it may be necessary to place wood or metal wedges in the cope close to risers and to draw them out as soon as possible after pouring to help relieve the stresses that may be developed by undue resistance of the sand.

Hold Ladle Close to Sprue

Necessity for minimizing metal agitation during the melting and handling of the metal has been discussed earlier. Similar precautions also should be exercised during the actual pouring of the casting. The metal should enter the sprue without splashing or violent agitation and the stream should not be broken at any time during the pouring operation. The ladle should be held as close to the sprue as possible as an excessive pouring height often results in dross and trapped air in the final casting.

Dross inclusions, shrinkage, porosity and cracks are the principal defects to be avoided in the production of castings, not only in aluminum alloys but in other metals as well. By the use of proper molding and metal handling practices these defects can be eliminated or at least so minimized as to have no practical effect on the performance of the casting. Some of the more common manifestations of these defects are listed in the following summary, together with brief comments on their cause and methods of correction.

(1) *Shrinkage Cavities*—The presence of shrinkage cavities indicates a lack of feeding or failure to produce a suitable solidification sequence. Such shrinkage usually can be eliminated by the use of adequate risers; by a suitable combination of risers and chills; or by a change in gating to provide cooler metal to the sections in which the shrinkage occurred.

(2) *Surface Shrinkage* — Shrinkage which is confined near the surface and particularly that appearing as small "worm" channels, is generally indicative of a high pouring temperature. Revising the gating to permit pouring at a lower temperature, or to provide cooler metal to the questionable section, will generally overcome this condition. A similar shrinkage may also be the result of hard ramming, excessive moisture, or the presence of volatile materials in the sand. Thin castings often will show surface shrinkage near the gates which can be eliminated by a small riser on the runner close to the casting.

(3) *Dross and Blow Holes* — Unsoundness due to dross and blow holes usually is caused by excessive agitation of the metal and failure to exercise care in skimming and

Fig. 9—Group of loose wood patterns for small aluminum alloy fittings

pouring. The use of scrap that has not been cleaned carefully prior to melting also can result in such unsoundness. Careful observance of gating and pouring practices and the use of skim gates are effective in minimizing such defects.

(4) *Pinhole Porosity*—Porosity in the form of small cavities is sometimes revealed on machined surfaces of castings. In most cases this is probably the result of gas absorbed by the metal during melting and handling or from the mold. Better melting conditions, lower temperatures, and care in the selection of the materials making up the metal charge will aid in reducing pinhole porosity. In addition, chilling and feeding are very effective. Lighter ramming of the mold to provide better permeability and control of moisture content are important considerations.

(5) *Cracks* — Cracks usually are caused by hot-shortness of the metal and therefore, the result of excessive resistance to the normal contraction of the casting during solidification and cooling. Consequently, elimination of the sources of this resistance is essential. Strengthening the sections where such cracks occur by means of ribs, fillets, or fins is often desirable. Castings may also be cracked by careless knock-out practice or removing the casting from the mold before it is sufficiently cooled. Localized shrinkage which results in a reduction in the area of a section and therefore increased stresses in the section, is often the initial cause of cracks. In these cases, elimination of the shrinkage generally eliminates the cracks.

French Foundrymen To Meet in Lyon

Annual convention of the Association Technique de Fonderie will be held June 9 to 11 at Lyon, the principal city of an industrial district in the southeast center of France.

List of subjects to be discussed includes the following: Standardization of methods of testing foundry sands—sand preparation; relation between the constitution of refractories and their behavior in regard to foundry practice; refractory lining of cupolas; application of machine molding to a limited series of castings; scheme of standardization of copper alloys; special bronzes resistance to oxidation and to corrosion; properties of resistance against corrosion of ordinary bronzes without additions; presentation of steel castings (presumably from the point of view of their outward appearance); casting of alloys resisting to oxidation; investigation on varnishes and paints used for patterns and coreboxes; parts cast in the body of a casting; rational lighting by day and night in foundries; and ventilation, heating and air conditioning in foundries, including the extraction of dust.

Issues Bulletin

Bulletin No. 298, "Resistance to Heat Checking of Chilled Iron Car Wheels, and Strains Developed under Long-continued Applications of Brake Shoes," by Edward C. Schmidt and Herman J. Schrader, has been issued by the engineering experiment station of the University of Illinois. It presents the results of an investigation of the effects of long-continued application of brakes upon the treads of chilled iron car wheels, particularly as regards the development of heat checks, cracks, and brake burns. A secondary purpose of the investigation was the determination of the strains and stresses set up in a wheel under such brake applications. Copies of the bulletin may be obtained from the engineering experiment station, University of Illinois, Urbana, Ill.

Reader's Comment

EDITOR'S NOTE—*Material Appearing Under this Head Does Not Necessarily Reflect the Opinion of The Foundry or of Its Editors.*

Lead Not Desired

TO THE EDITORS:

On page 40 of the March issue mention is made of an aluminum bronze composition for Ford worm gears which contains 2 per cent lead. However, the essential facts are that the original Ford specification required aluminum bronze containing 90 per cent copper and 10 per cent aluminum, and all makers of those gears had to conform to that specification. Use of lead in aluminum bronze was not considered seriously until just about the time that the Ford design was changed so that the aluminum bronze worm gear no longer was employed in trucks and tractors.

Of course a large number of replacement gears of aluminum bronze was required for trucks and tractors previously made, and lead was added more or less experimentally to improve machinability. Tests of the bronze containing up to 2 per cent lead gave fairly satisfactory physical tests, but that was not always the case. Consequently, further study was required before the lead content could be adopted for commercial use. That study developed the fact that lead materially weakened the structure of the bronze, particularly when subjected to tensile or fatigue tests. As a result, presence of lead in aluminum bronze, except as a microscopical impurity, is not acceptable today in most applications where aluminum bronze is used.

CONSTANT READER

Falls Short

TO THE EDITORS:

I believe there has been an error in the calculations presented on page 77 of the March issue of THE FOUNDRY in connection with the article "Are You Meeting Your Responsibility."

Based on the assumed 300,000 employes working for an average weekly wage of $28, the total weekly payroll of the foundry industry would be $8,400,000 and not $84,000,000, as shown in the article.

With this correction, I assume the figure of $100,000,000 for both wages and salaries should be revised perhaps to an arbitrary figure of $10,000,000 as the total weekly payroll of the foundry industry.

The article assumes that on the basis of intermittent operation, 20 weeks constitutes an average year's employment over good and bad times. On that basis, the annual payroll of the foundry industry would be $200,000,000 instead of $2,000,000,000 as expressed in the article. Of course the corrected figure falls far short of the one and one half billion dollars spent for Federal relief annually.

A READER

Keep Doors Open

TO THE EDITORS:

Referring to the question and answer which appeared in the February issue of THE FOUNDRY relative to the cupola hood burning away too rapidly, your suggestions in trying to overcome this troublesome feature are not answered to the fullest extent. One more remedy is left to eliminate the necessity of replacing the hood.

In some foundries the charging doors are closed after the last charge has been placed in the cupola. This cuts off the supply of secondary air which is necessary to complete combustion or as near complete as possible. Then the only opportunity the CO gas has to change to CO_2 is immediately under the hood. We know that CO has a B.t.u. value of 4450 and CO_2 a B.t.u. value of 14600, so what we are really doing is to burn the hood. Now, the most logical step to be taken is to keep the charging dors open all times and allowing the secondary air intake to enter at this point will bring the changing of CO to CO_2 just above the doors and will permit a gradual cooling of the flame to a temperature which will not damage the hood.

We had the same condition described in the recent question until this remedy was undertaken. The hood was replaced as often as twice a year which is an unnecessary expense in any foundry. The present one has been on for over 8 years and still is in good condition for many more. This information is passed on to save someone the added expense of an addition not needed.

F. L. WALDENMEYER
A. J. Lindemann & Hoverson Co.
Milwaukee.

Bed Too High

TO THE EDITORS:

Recently in the question and answer department of THE FOUNDRY a reader requested advice on operating an 18-inch cupola. He claimed that his melting rate was only 1000 pounds of molten metal per hour.

I have an 18-inch cupola in which my average heat of 2200 pounds is melted in 1 hour and 10 minutes. Air is supplied by a fan running at 3500 revolutions per minute. The bed coke extends to a point 30 inches above the tuyeres. After the coke burns through red to the top I charge 350 pounds of iron followed by 4 ordinary scoops of coke. For the remainder of the heat the weight of the iron charges remains the same, but the coke is reduced to 3½ scoops and to 2 scoops on the last charge.

I have no trouble getting hot iron. On a 2200-pound heat the total amount of coke is not quite 400 pounds. The trouble with the foundryman whose cupola melts only 1000 pounds per hour is that his bed is too high and his iron charges are too light.

E. W. JONES
E. W. Jones Foundry & Machine Works
Gulfport, Miss.

Book Review

Construction and Operation of the Cupola, Part II, by L. Schmid, paper, 235 pages, 6⅜ x 9¼ inches, published by Wilhelm Knapp, Halle (Saale), Germany, and supplied by THE FOUNDRY, Cleveland, and in Europe by the Penton Publishing Co., London.

This book, which is in German, is one of a series comprising a reference library on "Works Practice in Iron, Steel and Metal Foundries," which is edited by Hubert Hermanns. It is No. 20 of the series, and is the second part on construction and operation of the cupola; dealing with operation.

The volume is divided into four sections relating to various phases of cupola operation. The first deals with raw materials for the cupola, and gives information on foundry pig iron, cast scrap, steel scrap, briquetted borings, ferroalloys, foundry coke, and slagging materials. The second section discusses the chemical and physical reactions in the cupola stack and relates to such phases as changes in the ascending gas stream, changes in the descending charge, heat balance, and efficiency of some special cupola processes.

The third section deals with the determination of the size of, and the building up of the iron charge. It discusses the various component of cast iron, evaluation and application of raw materials, determination of the charge, and the composition of iron charges or special castings. The fourth section describes supervision of cupola operation and relates to raw materials and other materials, cupola wind, combustion processes, and molten iron.

What Is Dry Sand Strength?

(*Concluded from page* 32)

Fahr. will be established for the new mix which will give good results.

The point of this discussion is that the present standard dry strength test has value if we understand its limitations, but no foundry can or should attempt to establish a dry strength at 221 degrees Fahr. as a standard with the expectation that such standard strength will insure good castings from a variety of sands or bonding materials.

Many large molds are dried for fixed periods of time at some definite temperature. The dry strength or hardness of the mold depends upon time and temperature as well as bond and other factors. In this instance when a foundryman speaks of dry strength, he is not referring to dry strength at 221 degrees Fahr. nor at pouring temperatures but to the dry strength at a particular oven temperature.

Cannot Predict Dry Strength

The A. F. A. standard test procedure recommends that sand be baked at the same temperature as prevails in plant practice. This recommendation is disregarded widely and foundries commonly use the regular 221 degrees Fahr. test. Referring to the chart, it is apparent that foundrymen cannot predict dry strength at baking temperatures from the dry strength at 221 degrees Fahr. when changes are made in sands, bonds or proportions of materials. Hardness or dry strength of the mold is no indication of the casting to result when any changes are made in practice. Some molds hard and strong at baking temperatures may fail at pouring temperatures. This again points to the need of a better definition of the term dry strength and to more careful usage.

Some molds are skin dried by torch with wide variation in the actual temperature set up in the face of the mold. Dry strength or hardness varies with materials and temperature with the same lack of relation between standard (221 degrees Fahr.) test figures and casting results.

Production foundries, particularly, must avoid lumpy sand at the shake out, otherwise difficulty will be experienced in reclaiming and reconditioning sand in the usually limited time available. They also face a fairly serious loss of sand, if lumpy sand is rejected by screens which remove refuse material. This lumpy sand is due to too high dry strength but dry strength at what temperature? Of course, this will depend upon weight of the casting, thickness of sand in flask and length of time between pouring and shake out. Experience of the writer indicates that most of these lumps are formed between 500 and 1000 degrees Fahr. Natural sands and bonding materials which have high dry strength in this range, are the worst offenders in creating lumps. This offers another important phase of dry strength on which no information is given by the dry strength test at 221 degrees Fahr.

Sand Resists Contraction

Malleable foundrymen constantly must be alert to prevent castings from cracking. In a section of sand partly enclosed by metal a very high temperature can be predicted at the mold face with a sharp drop in temperature of the sand away from the mold face. Even in small pockets, the temperature probably does not exceed 1000 degrees Fahr. in the center. Although the sand at the mold face may collapse, some bonding materials reach their highest dry strength and hardness at the temperature of the sand inside the pocket. The sand as a whole will resist the contraction of the metal and cracked castings may result. The ideal sand would all collapse, but no present day natural or synthetic sand offers this desirable feature. Any attempt to reduce dry strength at 1000 degrees Fahr., usually reduces dry strength at pouring temperatures an equivalent amount with the possibility of cuts and washes as a result. A compromise usually is reached by using materials which maintain the lowest possible dry strength in the 500-1000 degrees Fahr. range, with sufficient dry strength at pouring temperatures to give good castings. The dry strength test at 221 degrees Fahr. gives no information on this important range.

Where a foundryman may have any one of five different features in mind when he uses the general term dry strength it is time to stop generalities and attempt to be more specific. The solution may be to mention the temperature condition about which he is thinking or to use such a phrase as dry strength at pouring temperature. He may not know the temperature set up in the mold face on pouring, but such a phrase at least will convey a specific and definite idea of the phase of dry strength under discussion. Unless this factor is borne in mind and expressly stated in any discussion of the subject the term dry strength is not definite enough.

Cracks Develop in Anvil Block

(*Concluded from page* 35)

the ratio is about 1 to 14 and this probably is the cause, or at least one cause of the failure.

For board drop hammers up to a 5000-pound falling weight capacity a special alloy iron developed by the company is employed. This iron shows a tensile strength between 52,000 and 55,000 pounds per square inch. However, for steam drop forging hammers a 0.40 per cent carbon steel is employed showing a tensile strength of 160,000 to 170,000 pounds per square inch. Steel is the material recommended for heavy duty drop forging hammers operated by steam.

For the work outlined, the forging of an aluminum alloy airplane motor half crankcase, nothing less than an 18,000-pound hammer is recommended. Aluminum alloys require a hammer of at least 50 per cent greater capacity than would be required for a corresponding job in steel. Forging of aluminum amounts to practically die to die operation all the time. Experience would seem to indicate that failure of the present block is due primarily to the material used, than to the lack of proper weight ratio and finally to lack of capacity of the tool itself.

A well known metallurgist and foundry expert agrees in a general way with the decision to change the composition and design of the anvil block. He claims that investigation has shown that the nickel-molybdenum combinations have developed the highest impact properties. In crankshaft castings it has been found necessary to alloy high enough to promote the retention of a certain amount of austenite to improve impact. For this reason it may be necessary to add alloys in larger quantities than outlined. Suggested suitable composition would show: Total carbon 3.25 per cent; silicon 0.50 per cent; manganese 1.25 per cent; sulphur 0.05 per cent maximum; phosphorus 0.15 per cent maximum; nickel 2.00 per cent; molybdenum 1.00 per cent.

Higher amount of alloys in the composition, with a lower silicon content should produce a desirable structure. Higher carbon would have a tendency to improve damping capacity of the block. The subfoundation for this large hammer may have contributed to the failure.

THE FOUNDRY will be pleased to present further comment on this peculiar problem. With a soft or comparatively soft material one might understand why continued impact might start a crack in the center rather than at the ends of the dovetails, but that line of reasoning does not seem to apply to such a rigid and nonductile material as gray iron.

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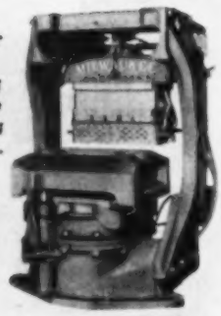

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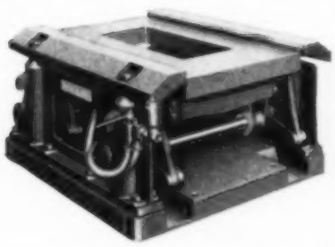

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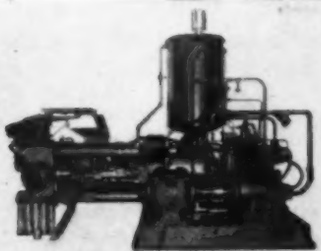

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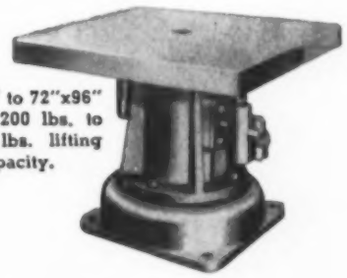

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Melting Nonferrous Alloys

(*Concluded from page* 33)

pended in different ways. One common method is to have it fixed so that it can be tilted down when it is time to dump the furnace for cleaning or repairs. Grating over the pit may be cast or wrought metal as desired.

Operation of the pit furnace is as follows: Charge the furnace with a satisfactory bed of burning fuel deep enough to support the crucible, if there is no firebrick block upon which to set the crucible. The bed must be deep enough to keep the crucible well up during the initial stages of melting. Charge the crucible first with small gates or risers or small pieces of alloy or metal to be melted to act as a cushion upon which the balance of the charge of ingots or heavy castings will rest.

Will Melt First

The small pieces will melt first, since their cross section is such that heat penetration is more rapid and will form a puddle into which the larger pieces will be submerged and gradually dissolved. The crucible is set on a fuel bed as described and then surrounded with loosely packed fuel. The draft is turned on if forced draft is used. In the case of natural draft, with the closing of the furnace covers, the draft of course is turned on automatically.

In some instances the fuel capacity of the furnace is insufficient to provide the necessary heat to complete the melting of the entire charge where the crucible is very large and the furnace fits rather closely. Consequently, refueling is necessary during the melting cycle.

To refuel underneath the crucible, it is necessary to lift the crucible with tongs and allow the burning fuel around the sides of the crucible to settle down and increase the depth of the fuel bed on which the crucible rests. This should be done carefully to make sure the crucible is on a solid footing throughout its entire base and is well supported on all sides.

Then fuel should be added quickly around the sides and the furnace closed so that a minimum length of time has elapsed for this operation. Therefore, the cooling of the charge has been at a minimum. If this practice is found to be necessary frequently, it indicates that the size of the furnace is inadequate for the size of the crucible and charge.

It also indicates that a good solid block of firebrick or graphite should be provided in the furnace center to support the crucible so that there will be no necessity for lifting the crucible when refueling, thus saving time in the refueling operation and reducing the amount of chilling.

As fast as the charge melts, the remainder of the charge is added until the crucible is filled to the desired level. To prevent excessive chilling of the previously melted alloy, that part of the charge awaiting addition to the bath should be placed where it will be heated, for instance, on the flue or on the furnace cover. It should be placed where a free flow of oxygen or air will insure the absence of underburnt gases. Nonferrous metals, copper in particular, even at a red temperature absorb underburnt gases.

Skim the Metal

When melted withdraw the crucible from the furnace and transport it to the molds, previously skimming it free of any slag or oxides that have accumulated on the surface. During the melting process it is important that none of the coke or coal gets into the crucible. Most coals and some cokes contain considerable sulphur which, if completely burned, is not harmful, but if some of the sulphur is allowed to be absorbed by the alloy, damage may result that might be serious from the defective castings standpoint.

To establish a definite standard for the amount of draft necessary, proper flue size, etc. is difficult without a rather complete survey of conditions under which the furnace is to operate. Barometric conditions will change the amount of draft for a given height of chimney and flue size. However, a test of furnace operations will indicate readily whether conditions are up to a reasonably satisfactory standard.

For example, it should not take longer than 1 hour to melt a charge of 150 pounds of bronze or brass in the ingot form, and many foundries with well designed flues and adequate stack heights are melting that amount in 45 to 50 minutes. This is a desirable condition as it reduces the time during which the metal is exposed to furnace gases and all the different ill effects that may be present under melting conditions.

Where the furnaces are designed to use forced draft, the speed should be such that not more than 40 to 45 minutes is required to melt the previously mentioned charge. If conditions permit an increase in this speed it is desirable to take advantage of it regularly to melt the maximum amount of metal with the minimum amount of trouble from the effect of furnace gases which metal will absorb.

A factor that is well to remember in operating pit furnaces with coal or coke as fuel, is the question of the size of pieces of fuel. Too small a size of coal or coke means the fuel packs closer and impedes the draft. Too large a size may open up excessively large channels and cause local chilling, resulting in crucible fracture or lack of support to the crucible.

For small furnaces, and it might be noted here that they are not very often used in foundries, coke or coal of the common stove size will give satisfactory results. However, for the usual run of foundry pit furnaces, coal of the egg size and coke which is of a size that would pass through a 3 or 4 inch ring, will give most satisfactory results in melting.

If for any reason the fire has to be dampened down to hold it until another charge can be put into the furnace, this is a good place to put the finer coke as it will retard the draft and hold the fire until it is again wanted.

To Hold Congress In Poland

The 1938 International Foundry congress will be held in Poland, under the distinguished patronage of the President of the Republic of Poland. Formal opening will take place Sept. 8 in Warsaw. Sept. 8, 9 and 10 will be devoted to technical sessions, a meeting of the International Committee of Foundry Technical associations and its committees, and plant visitation in and around Warsaw.

On Sunday, Sept. 11, there will be an organized visit in the metropolis of Poland. Monday, Sept. 12, is to be devoted to works visits in the industrial district of Poland, and two excursions will take place—one via Starachowice and Ostrowiec, and the other via the Upper Silesia. After visiting foundries, both excursions will meet in Wegierska Gorka on Sept. 14, and will proceed to the mountainous region of Zakopane. Sept. 14, 15 and 16 are to be devoted to excursions in the famous Polish mountain-chain Tatra and Pieniny, and a visit to the salt-pit Wieliczka. The congress will close on Sept. 17 in Cracow.

There will be many opportunities to visit the beautiful ancient metropolis of Poland, the city of Cracow, the King Castel Wawel, and the great cathedral where Polish kings lie buried together with the nation's famous men, including Marshal Jozef Pilsudski.

Cleveland Promises Treats

(*Concluded from page 27*)

R. E. Belt, Malleable Founders' Society, Cleveland, and C. S. Anderson, Belle City Malleable Co., Racine, Wis.; "Gray Iron Melting Costs," by P. E. Rentschler, Hamilton Foundry & Machine Co., Hamilton, O., and W. J. Grede and R. E. Lee, Liberty Foundry Co., Wauwatosa, Wis.; and "Nonferrous Melting Costs," by A. E. Grover, cost consultant, Berea, O.

"Silicosis and the Foundry Industry" will be the subject of a talk by Dr. Leonard Greenburg, New York state department of labor, division of industrial hygiene. Dr. J. H. Chivers, Crane Co., Chicago, will lead the discussion of Dr. Greenburg's paper.

"Job Evaluation for the Smaller Foundry" will be discussed by E. L. Roth, Motors Casting Co., Milwaukee, with R. H. Landes, Western Electric Co., Chicago, reviewing the occupational rating plan as developed by the American Management society.

A. C. Horrocks, educational director, National Association of Foremen, is to present an address on foreman training. Apprentice training in its various phases will be covered in talks by J. E. Tepoorten, Wisconsin Vocational Department, E. H. Brough, Fairbanks Morse Co., St. Johnsbury, Vt., and A. W. McCallum, Anthes Foundry, Winnepeg, Manitoba, Canada.

A partial list of the papers and committee reports scheduled for the various technical sessions follows:

Gray Iron

"Hints on Molding and Preparation of Castings for Enameling," by R. B. Schaal, Ferro-Enamel Corp., Cleveland; "Relation of Microstructure to Enamelability of Cast Iron," by Dr. G. H. Spencer-Strong, Porcelain Enamel Mfg. Co., Baltimore; "Physical Properties of Cast Iron in Heavy Sections," by E. R. Young, V. A. Crosby and A. J. Herzig, Climax-Molybdenum Co., Detroit; "Some Effects of Blast Pressures on Cupola Operation," by C. K. Donoho and Dr. James T. MacKenzie, American Cast Iron Pipe Co., Birmingham; "Cupola Operation," by Don J. Reese, International Nickel Co., Bayonne, N. J.; "Deoxidation and Graphitization," by R. G. McElwee, Vanadium Corp., Detroit; "Comparative Effects of Late Additions of Silicon and Titanium to Cast Iron," by G. R. Comstock and E. R. Starkweather, Titanium Alloys Mfg. Co., Buffalo; "Gates and Risers for High Test and Alloyed Cast Irons," by C. C. Brisbois and A. E. Cartwright, Robert Mitchell Co., Ltd., Montreal; "Formation of Graphite in Gray Iron," by Alfred Boyles, Battelle Memorial institute, Columbus, O.

Steel Castings

"Sand Control in Steel Foundries," by H. W. Dietert, E. E. Woodliff and J. A. Schuch, Harry W. Dietert Co., Detroit; Report of Committee on Methods of Producing Steel for Castings; Report of Committee on Heat Treatment of Steel Castings; "Steel Casting Design for the Engineer and Foundryman," by C. W. Briggs and A. R. Donaldson, Naval Research laboratory, Washington, and R. A. Gezelius, Taylor-Wharton Iron & Steel Co., High Bridge, N. J.; Report of Committee on Coupon Tests; "Low Ductility Values Caused by Over Annealing," by A. P. Gagnebin, International Nickel Co., Bayonne, N. J.; "Effects of Aluminum on the Physical Properties of Medium Carbon Cast Steel," by C. E. Sims, Battelle Memorial institute, Columbus, O.; Report of Committee on Radiography.

Malleable Iron

"Spheroidized Pearlitic Malleable Cast Iron," by Duncan Forbes, Gunite Corp., Rockford, Ill.; "Pearlitic Malleable," by W. E. Benninghoff, Ohio Crankshaft Co., Cleveland; "Production of Short Cycle Malleable Iron," by W. D. McMillan, International Harvester Co., Chicago; "Annealing Experiments on Malleable Cast Iron," by A. E. Boegehold, General Motors Corp., Detroit; "Atmosphere Control in Annealing Malleable Iron," by E. G. deCoriolis and R. J. Cowan, Surface Combustion Corp., Toledo, O.; "Design of Straightening Equipment for Malleable Iron Castings," by C. W. Weedfall, Saginaw Malleable Iron, Division General Motors Corp., Saginaw, Mich.

Nonferrous

"Risers and Gates for Nonferrous Castings," by A. E. Cartwright and C. C. Brisbois, Robert Mitchell Co., Ltd., Montreal; "Fluidity of Red Brass," by Geo. P. Halliwell, H. Kramer Co., Chicago; "Heat Treating Zinc Bronze Pressure Castings to Close Up Leakage," by H. Fleck and T. C. Bunch, Pearl Harbor Navy Yard, Honolulu, T. H.; Report of Committee on Analysis of Defects; Report of Committee on Recommended Practices; "Role of Silicon in Nonferrous Castings," by Dr. H. W. Gillett, Battelle Memorial institute, Columbus, O.; "Description of the Age Hardening Process as Applied to Castings," by L. W. Kempf, Aluminum Co. of America, Cleveland; "Production of Castings in Age Hardenable Nickel-Tin Bronzes," by T. E. Kihlgren, International Nickel Co., Bayonne, N. J.; "Melting Furnace Developments," by R. J. Stone, Vesuvius Crucible Co., Swissvale, Pa.

Sand Research

"What Happens to a Core in a Core Oven," by Jasper Willsea, Willsea Works, Rochester, N. Y.; "Effects of Different Electrolytes on A.F.A. Clay Determinations," by J. F. Haseman, Cornell university, Ithaca, New York.; "Sand Control," by A. S. Nichols, Illinois Clay Products Co., Chicago; Report of Committee on Sand Research.

Pattern Production

"Modern Pattern Production," by E. T. Kindt, Kindt-Collins Co., Cleveland; "Pattern Developments and Molding Methods," by Edward Hynans, Saginaw Malleable Iron division General Motors Corp., Saginaw, Mich.; Report of Committee on Pattern Making Apprenticeship Standards.

Refractories

"Effects of Cupola Operation on Refractory Consumption," by C. K. Donoho, American Cast Iron Pipe Co., Birmingham, Ala.; "Characteristics of The Silica Refractories Used in Cupolas," by W. J. Rees, University of Sheffield, Sheffield, England (Official Exchange paper presented on behalf of the Institute of British Foundrymen); "Refractories for Foundry Ladles," by C. E. Bales, Ironton Fire Brick Co., Ironton, O.

Materials Handling and Equipment

"Foundry Maintenance," by Carter Bliss, Scullin Steel Co., St. Louis; "Handling Sand," by P. Giberson, National Sand Co., Detroit; "Tramrail Distribution of Core Sands and Cores," by N. F. Anjesky, Cleveland Crane and Engineering Co., Cleveland.

Cleaning Castings

Ronald Webster, vice president, Hydro-Blast Corp., Chicago, recently discussed the hydro-blast method of cleaning castings before members of the Milwaukee Metal Trades club. Sand and water are applied at high pressures, and a process has been developed for recovering and classifying the sand. Approximately 50 pounds of sand and 30 gallons of water per minute are delivered at pressures in excess of 1000 pounds per square inch. Sufficient sand usually is recovered from the castings to met all the requirements of the cleaning method.

Group Activities

(*Concluded from page* 68)

talk with a motion picture showing the process as used at the Birdsboro Steel Foundry & Machine Co.

New England

APPROXIMATELY 100 members and guests attended the regular monthly meeting of the New England Foundrymen's association held at the Engineers' club, Boston, March 9. Pat Dwyer, engineering editor of THE FOUNDRY, spoke on "It's Scrap—Break It Up."

The speaker illustrated his talk, which was mainly on the gating and risering of castings, with several interesting slides showing many types of gates, runners, risers, skim gates, horn gates, sprues, and strainers. He stressed the necessity of paying as much attention to the making of gates as to the rest of the mold. Any mold that clean metal enters and fills in an ordinary quiet manner is bound to give a clean casting and a simple common gate is all that should be necessary in such cases.

Mr. Dwyer believes in pouring from the top and pouring fast as a general rule, although he said that there might be exceptions to both these rules. The principle of good gating is to distribute the metal rapidly, in as many places as is consistent, around the mold in a uniform manner. In speaking of the typical horn sprue, he said the best arrangement is to place the end with the larger opening adjacent to the casting where this is possible, permitting the metal to enter the mold with the least amount of agitation.

In discussing the relation between the area of a gate to the size of the sprue, Mr. Dwyer said that no set rule could be given to cover all cases, but in general the correct method is to have the gate slightly smaller in area than the sprue. He explained that knowing the weight of the casting, and the correct time to fill the mold being decided upon, it was a comparatively simple calculation to figure the required area for the controlling sprue or gate. Many of those present contributed to a most interesting question period and discussion which followed the talk.

Henry A. Jensen Sr., Lynn Works iron foundry, General Electric Co., president of the New England Foundrymen's association, notified the members that the regular meeting of the N. E. F. A. for April will not be held due to the New England Regional Foundry conference to be held April 8 and 9 at Massachusetts Institute of Technology, Boston. President Jensen introduced R. F. Harrington, Hunt-Spiller Mfg. Corp., Boston, who outlined in detail the tentative program for the regional conference.—*M. A. Hosmer.*

Chicago

GATING and risering, the topic at the March 14 meeting of the Chicago chapter, American Foundrymen's association, provoked free discussion at separate round table gatherings of the gray iron, steel, malleable and nonferrous groups. About 150 participated in the meeting.

M. Lefler, general foundry superintendent, Oliver Farm Equipment Co., South Bend, Ind., led the discussion of the gray iron session. Stressing the point that gating and risering should follow certain fundamental principles rather than be conducted on a hit-and-miss basis, Mr. Lefler indicated that the principal considerations are: 1. Number of gates; 2. size of gates; 3. location; 4. design of gates and sprues.

It was recommended that the number of gates be as few as possible, and that the size also be restricted but kept large enough to permit the metal to enter the mold before solidification. While location of the gate in the bottom of the mold often is favored and has certain advantages, placing the gate at the top of the casting may be less expensive.

Use of skim cores, superiority of round runners over runners of square section and pouring practice were subjects of general discussion. A brief resume of a paper on "Direct Riser Pouring" to be presented at the coming Cleveland convention was given by R. E. Kennedy, technical secretary, American Foundrymen's association.

Sample castings in which gating and risering problems had been encountered were introduced at the round table meeting of steel foundrymen, presided over by C. E. Westover, Burnside Steel Foundry Co. Bert Aamodt, steel foundry superintendent, National Malleable & Steel Castings Co., Chicago, was discussion leader. A similar procedure was followed at the malleable gathering which had as its discussion leader B. C. Yearley, malleable foundry superintendent, National Malleable & Steel Castings Co.

Slides illustrating proper methods of gating and risering were shown before the nonferrous group and discussed by C. V. Nass, brass foundry superintendent, Fairbanks, Morse & Co., Beloit, Wis. J. D. Burlie, Western Electric Co., Chicago, was chairman of this meeting.—*W. G. Gude.*

Many Committee Meetings Held During Rochester Regional

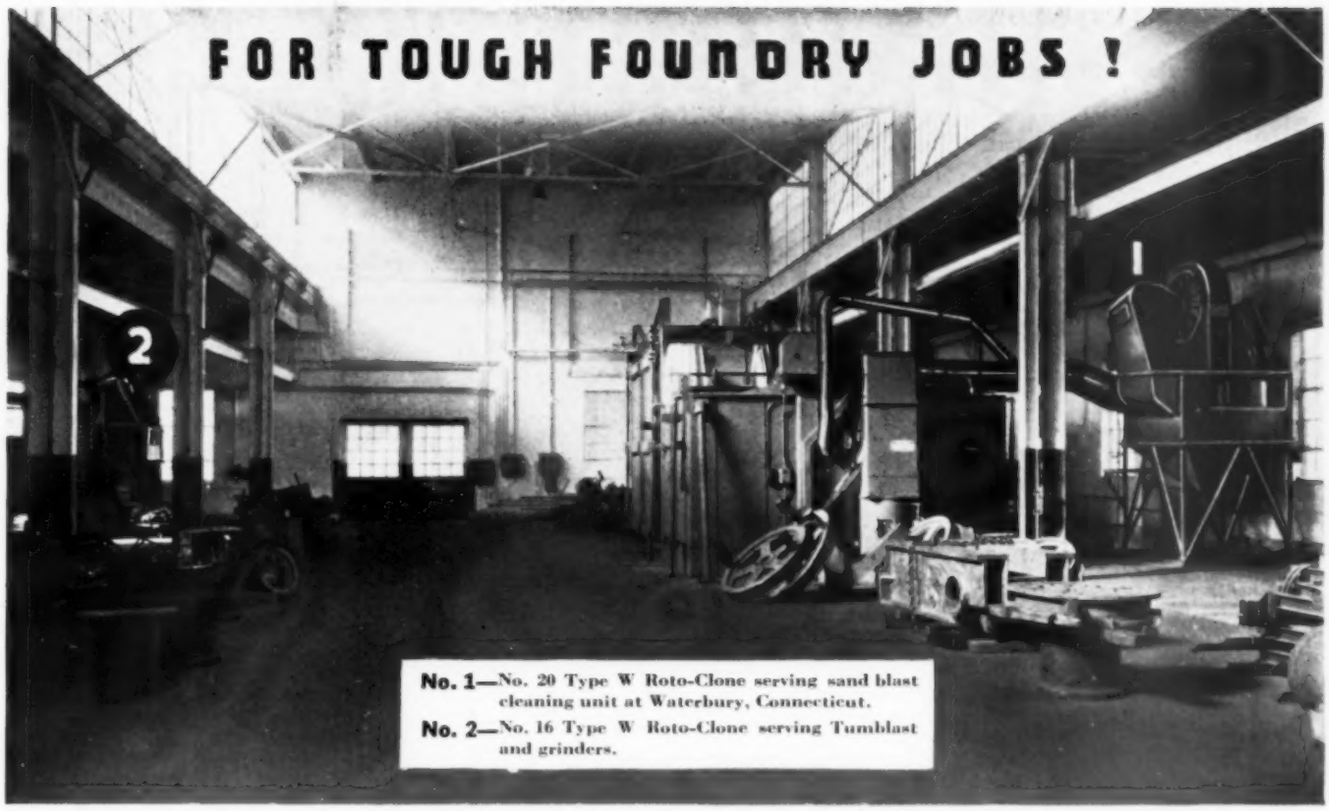
OVER 650 members and guests registered at the American Society for Testing Materials Committee week held in Rochester, N. Y. on March 7 to 11. Approximately 165 meetings of standing committees, subgroups and sections were held, at which a number of new specifications and tests were approved. Those will be submitted to the society at the annual meeting in June, subject to approval by confirming letter ballot.

A feature of the meeting was a symposium on plastics at which 6 technical papers were presented. Following the symposium an informal dinner was held at which approximately 450 were present. Several committee meetings of interest to the foundry field considered steel, malleable cast iron, cast iron, and nonferrous alloys. Committee A-1 on steel stated that further studies will be made on specification drafts for welding grades of carbon steel castings and molybdenum alloy steel castings for high temperature service, particularly on impurity elements and welding technique. Numerous proposed changes were recommended to be published as tentative in standards for alloy steel castings for valves and fittings for service from 750 to 1100 degrees Fahr.

Principal activity reported at the meeting of committee A-7 on malleable iron castings involved work of Professor Landon, Southern Methodist university, on recognition of the yield point of malleable iron. Results of the investigation are expected to be referred to the subcommittee on methods of test. A new subcommittee to cover welding just has been organized. A paper is to be prepared by Professor Enrique Touceda covering quenching temperature in treatment for prevention of galvanizing embrittlement.

Committee A-3 on cast iron reviewed various subcommittee activities. In the field of pig iron, the section in charge has been reorganized, and is investigating specification requirements. Two new subcommittees are to be appointed covering soil pipe and pressure pipe, and a new group has been appointed to investigate the 2-inch transverse test bar of the 60,000-

(*Concluded on page* 88)



No. 1—No. 20 Type W Roto-Clone serving sand blast cleaning unit at Waterbury, Connecticut.

No. 2—No. 16 Type W Roto-Clone serving Tumblast and grinders.

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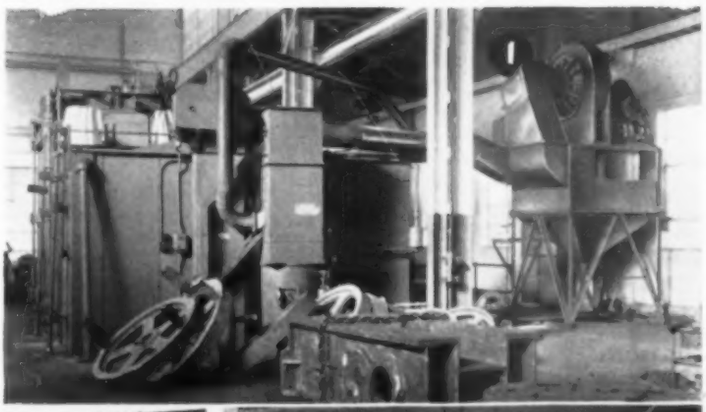

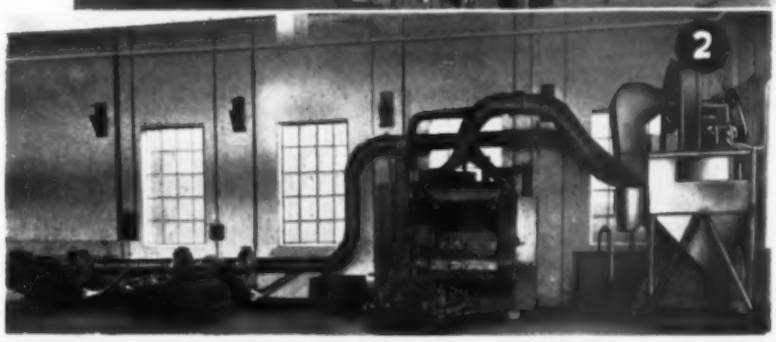

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Type W

ROTO-CLONE
WATER SPRAY DYNAMIC PRECIPITATOR

(*Concluded from page* 86)

pound per square inch class in the standard specification for gray iron castings, (A48-36). The section on white and chilled cast iron held its first meeting at which a research program to evaluate properties of those classes of iron, was outlined.

In order to meet demands for a test procedure for determining thickness of zinc coating on hot galvanized irregularly shaped hardware, especially steel castings and forgings, and gray iron and malleable iron castings, committee A-5 on corrosion of iron and steel has developed a proposed Preece test procedure which is to be referred to the society for publication as tentative. That test has been investigated intensively by various members of the committee particularly those in a special section of subcommittee VIII on test methods under the chairmanship of F. L. Wolf, Ohio Brass Co., Mansfield, O.

Committee B-5 on copper and copper alloys, cast and wrought, will submit, subject to letter ballot of the committee, revisions in tentative specifications for bronze castings for turntables and movable bridges (B22-36T), and tentative revisions are being proposed in the chemical composition requirements of the specifications for aluminum bronze castings (B59-36). The committee also recommended adoption as standard the specifications for bronze castings in the rough for locomotive wearing parts (B66-36T), and to withdraw existing standards for sand castings of the alloy, 80 per cent copper, 10 per cent tin, and 10 per cent lead (B74), and yellow brass sand castings for general purposes (B65).

In specifications covering manganese bronze ingots (B7) and sand castings (B54), two alloys of higher tensile strength and lower elongation in which manganese is used as a deoxidizer are under consideration for incorporation. The committee is working on standardized requirements for the nickel-bearing copper alloys which include compositions up to 31 per cent nickel. Another study underway in the committee is the possibility of a general regrouping and reclassification of various standards covering casting alloys. Details of committee reorganization were reviewed. It is planned to set up 12 new subcommittees including those on copper-base alloys for sand castings (50 per cent or over copper), methods of test, and publication of general information.

Committee B-7 on light metals, cast and wrought, considered numerous specifications, and proposed some revisions involving composition of aluminum base alloys in ingot form for permanent mold castings (B112), and some modifications in the aluminum base alloy permanent mold castings (B108). It is expected that those will be referred to the society for approval at the annual meeting in June. In its work on magnesium base alloys, changes have been developed in 5 specifications. In B93 covering magnesium ingot for remelting, two alloys are being deleted, and 3 new alloys are to be added, of which one is for castings. In its 1938 annual report, the committee plans to include a paper on, "Effects of Methods of Gating on Physical Properties of Aluminum Alloy Test Bars."

New England Plans For Large Crowd

Growing interest in regional foundry conferences leads the committee in charge of arrangements for the second New England conference, headed by Chairman Rufus F. Harrington, Hunt-Spiller Mfg. Corp., Boston, to expect an attendance well beyond that of last year. Six interesting technical sessions have been planned for the 2-day meeting which will be held on April 8 and 9 at Massachusetts Institute of Technology, Cambridge, Mass., under the joint sponsorship of the institute, New England Foundrymen's association, and the A. F. A.

The tentative program is as follows:

Friday, April 8

9:00 a.m. Registration.

10:15 a.m. Opening remarks by Chairman R. F. Harrington, foundry superintendent and chief metallurgist, Hunt-Spiller Mfg. Corp., South Boston, Mass.

Welcome by J. M. Lessells, associate professor of mechanical engineering, Massachusetts Institute of Technology, Cambridge, Mass.

10:30 a.m. Luman S. Brown Session.

Chairman: E. H. Ballard, general foundry and pattern shop superintendent, General Electric Co., West Lynn, Mass.

"Application of Dust Control Principles to Foundry Operations," by Ralph R. Meigs, assistant chief engineer, Liberty Mutual Insurance Company, Boston.

Discussion by Manfred Bowditch, Division of Occupational Hygiene, Department of Labor and Industries, Commonwealth of Massachusetts, Boston.

Discussion by Warren F. Terry, engineer, Boston.

12:30 p.m. Luncheon—Walker Memorial.

2:00 p.m. Technical Session.

Chairman: N. L. Mochel, metallurgical engineer, Westinghouse Electric & Mfg. Co., Philadelphia.

"Controlled Directional Solidification as Related to the Design of Castings," by C. W. Briggs, physical metallurgist, U. S. Naval Research laboratory, Washington.

Discussion.

Demonstration of Crystallization by P. E. Kyle, department of mechanical engineering, Massachusetts Institute of Technology.

6:30 p.m. Dinner—Walker Memorial.

Speakers: Dr. Vannevar Bush, vice president and dean of engineering, Massachusetts Institute of Technology.

Marshall Post, vice president and works manager, Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa. and vice president of the A. F. A.

Sir James Alexander, Scottish journalist and traveler, on "Some Impression of America."

Saturday, April 9

9:00 a.m. Registration.

9:30 a.m. Technical Session.

Chairman: W. G. Reichert, metallurgist, Singer Mfg., Elizabethport, N. J.

"Sand Control in the Foundry (Sand Test Demonstration), by H. W. Dietert, president, Harry W. Dietert Co., Detroit.

Discussion.

12:30 p.m. Luncheon—Walker Memorial.

12:30 p.m. Round Table Luncheon.

"Training of Foundry Engineers in Technical Schools."

2:00 p.m. Technical Session.

Co-chairmen: H. W. Dietert, Harry W. Dietert Co., Detroit and W. G. Reichert, Singer Mfg. Co., Elizabeth, N. J.

"Casting Defects."

5:00 p.m. Adjournment.

Adventures of Bill

(*Concluded from page* 54)

are staunch supporters of St. Paul in his expressed views on the efficacy of prayer. That is practically the only medium the molders have for holding sand in the copes. At the present rate of disappearance a gagger soon will be a curiosity to be shown under glass in a museum. Shriveled up little old molders will shuffle past the case and explain to any interested spectator that at one time gaggers were so common and plentiful that even the apprentice boys used them.

5—In a commendable effort to bring a little sunshine into their lives, a certain foundry works the men 12 hours one day and maybe 4 hours another day to even up an 8-hour a day average. Production is speeded by placing every conceivable hindrance in the way of the molder. A single crew of helpers gets everything in a holy mess. A suggestion that a second crew be hired to clean up after the first crew was not received with favor. Operating profits were curtailed so sharply during the year that the company was limited to building a large garage for the office force cars, but reluctantly was forced to forego the pleasure of providing the men in the shop with lockers or with hot water for washing. Operating costs are cut to a gratifying extent by having molders at $1.00 per hour get their own flasks, boards, etc., instead of having the work done by ordinary labor at 50 cents per hour.

"Grumpy must have experienced a great sense of relief," I said, "to get that load off his mind."

"That's no load," said Bill. "Every molder is a natural born kicker. I never knew one yet that couldn't run the shop better than the old man."

NEW EQUIPMENT and SUPPLIES

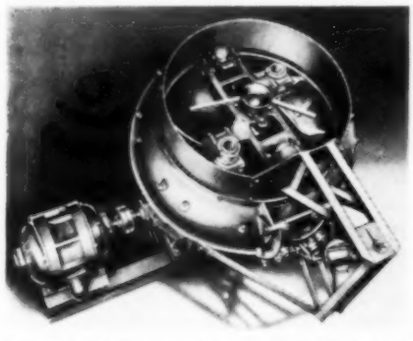
Push-buttons

General Electric Co., Schenectady, N. Y., recently has announced a line of standard duty push-button stations designed to resist the deteriorating action of oil and dirt encountered in machine-tool applications. These small stations are provided with a graphited packing ring between the button proper and the bushing, or oil guard. This packing ring is said to prevent the seepage of oil or grease from operators' gloves or hands into the button mechanism.

Sand Mixer

Beardsley & Piper Co., Chicago, has introduced a new speedmuller designed for use in large foundries. This mulling unit employs three large rubber-covered mulling balls in place of two as used in the smaller machines manufactured by that company. The bowl is made in segments and is so constructed that it is rotated easily on the base to allow for any position of the sand discharge gate. Three outside and three inside plows are provided for delivering the sand outwardly, inwardly and upwardly, and for holding the sand in suspension in the path of the muller balls during the operating cycle.

This unit is said to have a sand conditioning capacity of from 50 to 75 tons of foundry sand per hour. Lubrication of the entire drive mechanism is effected by a positive pressure pump located in a sump in the base of the gear housing.



Plows hold the sand in suspension in the path of three muller balls

Sand Riddle

Foundry Supplies Mfg. Co., Chicago, has introduced a new type sand riddle with a rotary shifting movement featuring a completely enclosed mechanism. The motor is air cooled, and entirely sealed against dust and grit. It is provided with grease-packed ball bearings which require no lubrication.

Activating weights of the machine which provide the rotary vibration are so arranged as to swing free, thus preventing the ball bearings from being pounded. As a result, it is claimed that life of bearings is increased greatly. The riddle is made to use the company's all-steel bottom and steel-rimmed sieves. Sieves are mounted in a steel ferule and clamp quickly onto the split-ring bottom. They are easily interchangeable and offer a 20-inch diameter clear sifting area. Standard equipment includes a 1/3-horsepower motor and ground wire which, when connected, prevents possible shocks to operators. Overall height of the sifter is 62 inches; weight is approximately 90 pounds. The one-piece rigid frame is made of aluminum alloy.

Spindle Grinder

Hammond Machinery Builders, Kalamazoo, Mich., has announced a new overhanging spindle grinder designed for large bulky work where extra space around the wheel is at a premium. Although the grinder is shown in the accompanying illustration without work rests, they may be fitted. The top section overhangs 12½ inches from the lower front of the base; the distance between wheels is 40⅜ inches; the spindle is 52 inches long overall; and the grinder is fitted with 14-inch diameter guards. Standard equipment includes push button control with automatic motor starter having thermal overload protection. The net weight of the machine is 1200 pounds.

Overhanging spindle grinder designed for large bulky work

Lighting Unit

Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., has developed a new lighting unit designed for use in foundries and similar heavy industry applications where moisture, smoke, dust, dirt, acid fumes or general hard use preclude the use of open type high bay units.

The complete unit, shown in the accompanying illustration, consists of a steel housing, a specular or diffuse removable reflector, and a hinged glass cover. It is arranged for ½-inch conduit mounting but can be furnished for ¾-inch conduit. The reflector is spun from 14 gage

Lighting unit is designed for use in foundries and other heavy industries

aluminum sheet. The reflecting surface for medium mounting units is semispecular finished; for high mounting units specular finished. The outside surface is finished with acid-resisting high-bake, multi-coat enamel.

A one-piece steel housing drawn from 20 gage steel sheet completely encloses the reflector. The hinged glass cover door consists of a clear lens of highly tempered glass which is designed to withstand sharp temperature changes without fracture or breakage. A cast aluminum ring, complete with gasket, is hinged to the steel housing and locks in place by three, cadmium plated, malleable iron hook bolts. The locking arrangement permits the glass cover door to be opened or closed without tools.

Electrode Holder

Delong-Cramer Co., Southgate, California, has developed a new electrode holder for welders. Although it is made in three sizes to take rods from 1/16 to ⅜-inch diameter, its fiber handle, uniform for all sizes, is fitted with replaceable jaws. These jaws are made of heat treated spring steel, with serrated faces designed to prevent electrodes from slipping. The handle is air-cooled and has a fiber heat shield that protects the operator and prevents a short circuit if the tool is laid down. It is claimed that the design of the jaws permits quick insertion of rods in any position and that freedom from levers, springs and hinges makes the holder particularly valuable for work in limited space.

Air Compressor

Fairbanks, Morse & Co., 900 South Wabash avenue, Chicago, has put on the market a new self-contained, diesel-powered, 210-cubic-feet-per-minute air compressor designed for a wide range of service applications. It is designed to operate at full engine speed, permitting direct connection to the engine, a four-cycle, six-cylinder medium-high speed diesel. The complete unit is available with several types of mounting: wooden skid, steel wheel, solid or pneumatic rubber tired wheel, four or two-wheeled trailer, and motor or railway truck.

Lift-jack and Skid

Barrett-Cravens Co., 3255 West Thirtieth street, Chicago, has recently placed on the market a new lift-jack designed for use in industries not requiring a complete lift-truck installation. The combined jack and skid, shown in the accompanying illustration, will raise a load of 5000 pounds with a lifting effort on the handle of 142 pounds.

The operator wheels the lift-jack into the lifting horn on the skid. Then a downward motion of the handle lifts the two skid legs clear of the floor. A positive acting latch holds it locked in this position. To lower the skid, the towing handle is lowered toward the floor, releasing latch and permitting the loaded skid to settle.

The combined jack and skid will lift a load of 5000 pounds

For special shapes and kinds of material, skids with a variety of superstructures are available. Maple topboards are bound with steel, although skids with steel tops are also manufactured. Wheels on both skids and jacks are chilled iron, 9-inch diameter.

Electric Meter

Bristol Co., Waterbury, Conn., has developed an instrument for measuring and transmitting electrical units such as volts, amperes, and watts. The principle involved has been used for a number of years in transmitting readings of pressure, temperature, flow, mechanical motion, etc., from a transmitter at the point of measurement to a receiver, which is a recording or indicating instrument, at some distance away. A cam, driven by a constant-speed motor gives the electrical impulses required to operate the system. The device is designed so that as periodically it engages and releases the pointer arm of the element, no strain is placed on the element.

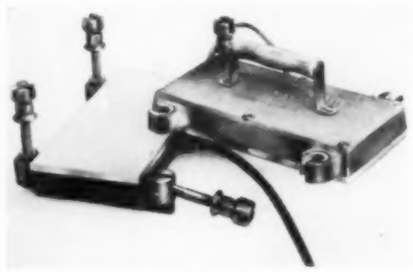
Furnace Controller

C. J. Tagliabue Mfg. Co., Brooklyn, N. Y., has developed a new indicating photoelectric controller for electric furnaces and ovens. With this instrument the heat supply is made to vary inversely as the temperature. It is an indicating potentiometric controlled with photoelectric detection of the position of a light beam reflected from a mirror galvanometer toward a reciprocating controlling edge. Life of the furnace switch or magnetic contactor is maintained by selecting the frequency of cycles according to the power requirements. When the lamp is burned out, the power is shut off. The circular scale and slide wire are 15 inches long and temperatures can be read within the accuracy of 0.1 per cent of the range. The scale appears through a glass window and temperatures are indicated by a brilliant white, red or green line of light which is visible at some distance.

Belt Vulcanizer

Ton-Tex Corp., 129 West 22nd street, New York, recently has developed a vulcanizer for fabric or rubber belts. The device, shown in the accompanying illustration and weighing 36½ pounds, may be used on belts in place on the machine, or on the bench where the belts are brought to it. The main castings, a strong aluminum alloy, reduce weight while providing sufficient thickness of section to hold substantial volume of vulcanizing heat. Both upper and lower platens are heated thus increasing the speed of operation and eliminating the necessity of turning the device upside down to vulcanize the lower side of the belt.

Either alternating or direct current may be utilized and it is claimed the vulcanizer is ready for operation 30 minutes after it is plugged in. A specially developed thermostat prevents the vulcanizer from departing from the true vulcanizing temperature while in service. If necessary the vulcanizer may be suspended by a chain hoist, a block and tackle or a single rope attached to the handle.



Upper platen is swung to one side for insertion of belt

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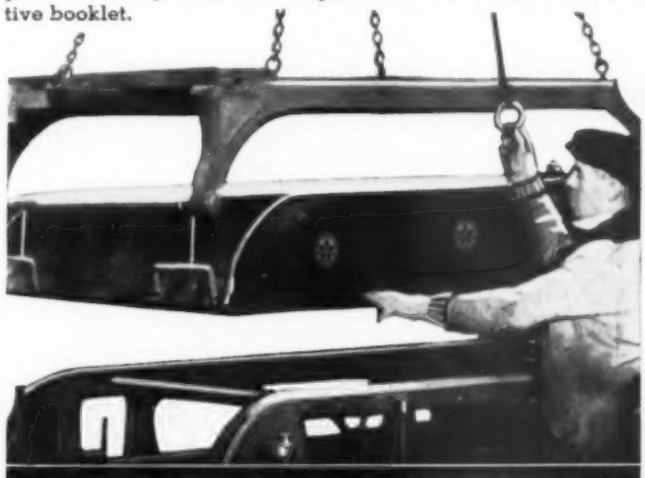

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OBITUARY

JAMES SANDS, 71, superintendent, Superior Foundry Co. and its predecessor, the Gartland Foundry Co., Cleveland, for the past 46 years, died March 11 at his home in that city.

• • •

Isaac F. Baker, 87, retired general superintendent, Lynn, Mass. works of the General Electric Co., died at his home in Lynn on Feb. 17. He had served in that capacity for more than 35 years.

• • •

Votaw S. Durbin, 53, owner of the Durbin Steel & Malleable Castings Co., Evansville, Ind., formerly the Evansville Malleable Works, died recently at his home in that city.

• • •

Charles A. Swallow, superintendent, Richmond Malleable Iron Co., Richmond, Ind., and former superintendent of the Acme Steel & Malleable Iron Co., Buffalo, died recently at his home in Richmond, Ind.

• • •

Charles K. Weiss, 59, for the past 10 years superintendent of foundries, Thatcher Furnace Co., Garwood, N. J., died recently at his home in Garwood. Previous to his association with the Thatcher company, Mr. Weiss was at various times identified with the Central Radiator Co., Lansdale, Pa., the J. H. McLain Co., Canton, O., the Atlantic Radiator Co., Huntington, Pa., and the Monitor Bi-Loop Radiator Co., Lancaster, Pa.

• • •

Winthrop C. Neilson, 60, a vice president of the Aluminum Co. of America, Pittsburgh, died at his home in Ardmore, Pa., March 12. Mr. Neilson was born in Philadelphia and attended the University of Pennsylvania, from which he graduated in 1899. Besides his activities in the Aluminum Co. of America, he was concurrently president of the Republic Mining & Mfg. Co. and held offices and directorates in a number of other organizations.

• • •

Henry Clayton Macaulay, 83, H. C. Macaulay Foundry Co., Berkeley, Calif., died Feb. 22 at his home in that city. Mr. Macaulay was born in Providence, R. I., and went to California in 1890 where, for several years, he was foreman for the National Iron Works in San Francisco and later was connected with the firm of Byron Jackson. In 1896 he opened the Macaulay Foundry in San Francisco and continued its operation until the fire of 1906. He then moved to Berkeley and reincorporated under the name of H. C. Macaulay Foundry Co. Mr. Macaulay was a leader in civic affairs.

• • •

Charles Bester, 56, died March 3 at Xenia, O., where he had been in the employ of the Xenia Casting Co. Burial was in Ironton, O., his original home, where he had served his apprenticeship and later acted as superintendent at the plant of the Foster Stove Co. At various periods he served as foundry superintendent for the G & C Foundry Co., Sandusky, O.; May-Fieberger Co., Newark, O.; Superior Gas Engine Co., now the National-Superior Co., Springfield, O.

• • •

Charles W. Hotchkiss, 68, an executive of the National Malleable & Steel Castings Co., Cleveland, for 25 years, died Feb. 20 at his home in that city. Mr. Hotchkiss graduated from Kenyon Military school and became associated with the Cleveland Malleable Iron Co., predecessor of the National Malleable organization. He worked at a variety of jobs with the company and rose through the ranks over a 15-year period to become superintendent of the new Cleveland plant in 1905, becoming plant manager 5 years later. Fourteen years later he was made production manager for all the plants, a position which he held until his retirement from active duties in 1930. He retained his directorship, however, until his death.

• • •

W. Scott Thomas, 60, manufacturers' agent for foundry supplies and equipment, Providence, R. I., died Feb. 22 at his home in that city after an illness of about a year. Mr. Thomas was born in Philadelphia in 1878. Early in his youth the family moved to Sayre, Pa. where he was educated in the public schools. He then served time as a machinist in the Lehigh Valley Railway shops, and at the age of 23 entered the employ of the J. W. Paxson Co., Philadelphia. For several years he was a salesman for that organization and in 1910 was sent to Detroit as western manager. In 1911 he was transferred to Providence where he was New England manager for the Paxson Co. for 14 years. In 1925 he engaged in the same business for himself, covering Rhode Island, eastern Massachusetts and Connecticut. The business will be continued by Mrs. W. Scott Thomas.

Black & Decker Mfg. Co., Towson, Md., has opened a factory service branch at 630 Baronne street, New Orleans, La.

Study Metal Wear

Engineering experiment station, Ohio State university, Columbus, O., has announced the publication of its bulletin No. 97, "Wearing Properties of Some Metals in Clay Plant Operation," by Arthur H. Dierker and J. O. Everhart, research professors. This report on 39 materials, including various compositions of cast iron, steel, and malleable iron, gives the comparative wear in pug-mill knives, muller tires, die liners, and screen plates, important parts of heavy clay working machinery.

Paint Symposium

American Society of Testing Materials, 260 South Broad street, Philadelphia, has made available a 49-page publication entitled, "Symposium on Correlation Between Accelerated Laboratory Tests and Service Tests on Protective and Decorative Coatings." It contains brief statements by 25 technical authorities and is divided into three sections on finishes for indoor service, paints for exterior service on wood, and paints for iron and steel. Copies of the publication may be secured from the society for 60 cents each.

Represent Firm

Midwest Sand & Supply Co., Edwardsville, Ill., has been appointed representatives of the Cleveland Quarries Co., Cleveland, for the sale of firestone and other products in Missouri, Kansas, Iowa, Nebraska, Oklahoma, Texas and Illinois, south of Springfield. T. C. Hamlin is manager.

Carpenter Bros. Inc., 342 North Water street, Milwaukee, has been appointed representatives of the Cleveland Quarries Co. in the state of Wisconsin.

Steel Problems

Public Affairs Committee, Inc., 8 West Fortieth street, New York, recently has published a pamphlet entitled "Steel—Problems of a Great Industry." Prepared by Maxwell S. Stewart, the pamphlet discusses prices and wages in the steel industry as they were effected by the NRA and the Wagner labor relations act.

The Verein deutscher Eisenhuettenleute (Association of German Iron and Steel Metallurgists), Dusseldorf, Germany, has made available a 22-page reprint from *Stahl und Eisen*, on "Aus der Taetigkeit des Vereins deutscher Eisenhuettenleute im Jahre 1937" (Activities of the Association of German Iron and Steel Metallurgists in the year 1937).

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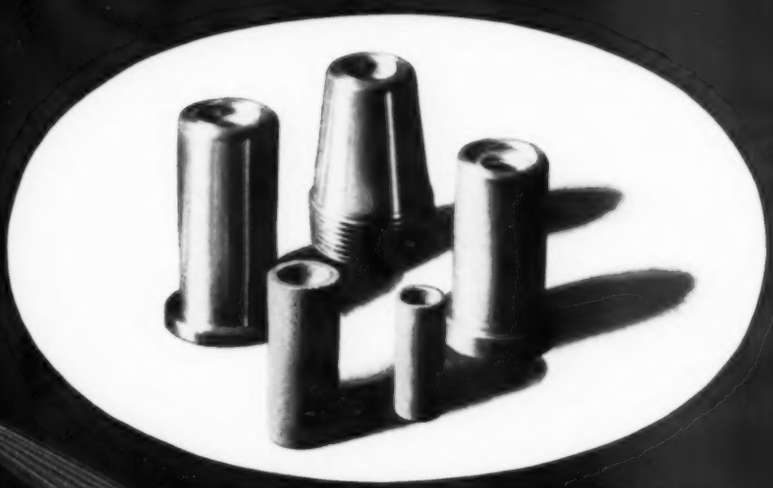

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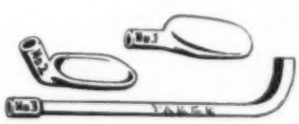

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228 N. LaSalle St. Dept. FD4 Chicago, Ill.

FOUNDRY ACTIVITIES

PEERLESS PATTERN WORKS, Detroit, has moved to its new building at 9455 Grinnell avenue which has been designed and equipped to meet requirements for patterns, body modeling, tool and machine work, and general foundry engineering.

Kincaid & Osborn Co., San Antonio, Tex., has installed an electric furnace, supplied by the Pittsburgh Lectromelt Furnace Corp., Pittsburgh, for the production of plain and alloy steel castings in its new foundry.

Index of foundry equipment orders for February, according to a report of the Foundry Equipment Manufacturers' association, Cleveland, was 90.4 as compared with 76.8 in January and 248.5 in February, 1937. Index of shipments was 80.9 as compared with 147.7 in January and 201.8 in February of the previous year.

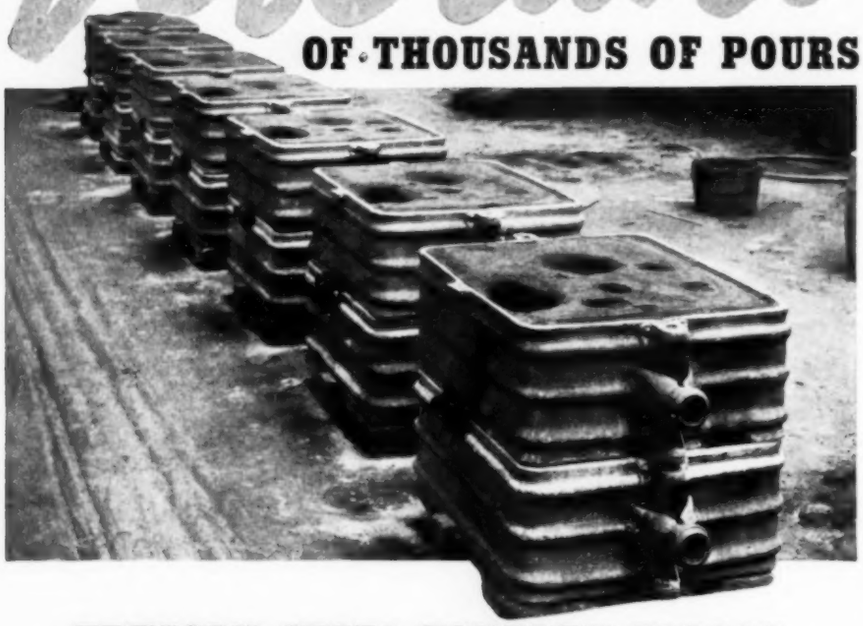
Reliance Foundry Co., 506 East Front street, Cincinnati, O., is planning construction of a new foundry and coreroom. Estimated cost is $20,000.

Production of gray iron and steel castings in the Philadelphia Federal Reserve district decreased during January, according to reports of the Industrial Research department, University of Pennsylvania. Output of gray iron castings was 13.8 per cent less during January, and steel castings decreased 12.0 per cent.

Vulcan Foundry Co., Homer, Mich., is planning to resume operations, according to James A. Murphy, one of the owners of the company. Wallace A. Barbee, John R. Van Asperen and Albert S. Barbee will be associated with him in operation and management of the plant.

Ottawa Foundry Co., 108 North Walnut, Ottawa, Kans., has been leased to C. T. Ludwig. The foundry, formerly owned by Charles H. and Fred P. Martin, will be operated by Mr. Ludwig and his son Richard. Plans for a number of improvements already are underway and construction of an addition to the coreroom started.

Veterans
OF THOUSANDS OF POURS



TRUSCON STEEL FOUNDRY FLASKS
SURVIVE YEARS OF ACTIVE SERVICE

The Truscon Flasks illustrated have been rammed, poured and shaken out thousands of times and are ready for more. Maintenance costs have averaged only a few cents per year per flask. You can get that kind of service plus all other advantages of light weight and super-strength when you standardize on Truscon Copper-Bearing Steel Foundry Flasks. *Write for complete catalog.*

TRUSCON STEEL COMPANY • FOUNDRY FLASK DIVISION
6100 TRUSCON AVENUE • CLEVELAND, OHIO
Subsidiary: Republic Steel Corporation

TRUSCON
COPPER-BEARING STEEL FOUNDRY FLASKS

RAW MATERIAL PRICES
March 22, 1938

Iron	
No. 2 foundry, Valley	$24.00
No. 2 Southern Birmingham	20.00
No. 2 foundry, Chicago	24.00
No. 2 foundry, Buffalo	24.00
Basic, Buffalo	23.00
Basic, Valley	23.50
Malleable, Chicago	24.00
Malleable, Buffalo	24.50
Charcoal iron, furnace	27.00
Coke	
Connellsville beehive premium	$ 5.75 to $ 6.25
Wise county beehive coke	5.00 to 5.25
Detroit by-product delivered	11.10
Scrap	
Heavy melting steel, Valley	$13.25 to $13.75
Heavy melting steel, Pitts. (dlv.)	13.25 to 13.75
Heavy melting steel, Chicago	12.00 to 12.50
Stove plate, Buffalo	11.00 to 11.50
Stove plate, Chicago	8.50 to 9.00
No. 1 cast, New York	12.00 to 12.50
No. 1 cast, mchy., Chicago	11.50 to 12.00
No. 1 cast, Pittsburgh	15.50 to 16.00
No. 1 cast, Philadelphia	15.50 to 16.00
No. 1 cast, Birmingham	14.00 to 14.50
Car wheels, iron, Pittsburgh	15.00 to 15.50
Car wheels, iron, Chicago	14.00 to 14.50
Railroad malleable, Chicago	14.00 to 14.50
Malleable, Buffalo	13.50 to 14.00
Nonferrous Metals	**Cents per pound**
Castings copper, refinery	9.52½
Straits tin	41.50
Aluminum, 99 per cent	20.00
Aluminum, No. 12 (Secondary, standard)	15.75 to 16.25
Lead, New York	4.50
Antimony, New York	13.75
Nickel, electro	35.00
Zinc, East St. Louis, Ill.	4.25

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HANNA PIG IRON

BRANDS: Buffalo, Detroit, Susquehanna

GRADES: Foundry, Malleable, Silvery, Ferro-Silicon

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MERCHANT PIG IRON DIVISION
OF NATIONAL STEEL CORPORATION
Buffalo Detroit New York Philadelphia Boston

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"Don't Accept A Substitute"

GOULAC

Carried in stock by the leading Foundry Supply Jobbers.

ROBESON PROCESS COMPANY
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General Offices:
500 Fifth Ave., New York City

Plants:
AuSable Forks, N. Y.; Erie, Pa.

Foundries say

"The Willsea Heater has given us everything the Willsea Works claimed—quicker drying, no burned cores and large cores weighing a ton of pitch compound are baked with oil sand weighing fifty pounds and with equal results."

"We cannot talk too highly of the Willsea Heater that we installed in our foundry core oven. We used to run two core ovens and now we only have to run one."

"The Willsea Heater has been one of our most satisfactory investments."

"Before we installed the Willsea Heater, we had great difficulty in locating the small cores so that they would dry properly in conjunction with the larger cores. This procedure allowed us one drying in twenty-four hours. With the Willsea Heater, we are drying two and three times in twenty-four hours."

"The Willsea Heater has helped us considerably and has been a real saving to us." (This foundry has purchased five more heaters.)

These are just a few excerpts from the many letters in our files. Note that one foundry bought five more Heaters. This is only one of several repeat order installations. The baking results and savings claimed for the Willsea Heater are backed by actual results obtained in various types of foundries. Willsea Heaters for your ovens will assure better baking—in less time—and at a considerable saving in production cost.

Mail the coupon for descriptive literature. Send us a rough sketch of your ovens for a tentative layout and a proposal for your requirements.

THE WILLSEA WORKS
1042 University Ave., Rochester, N. Y.

Without obligation, please send your folder describing the WILLSEA HEATER.

Name _____

Firm _____

Street _____

City _____ State _____

NEW TRADE PUBLICATIONS

Copies of any of the literature listed below may be obtained by writing directly to the companies involved, or by addressing THE FOUNDRY, in care of Readers' Service Department, 1213 West Third Street, Cleveland

FURNACES—Surface Combustion Corp., Toledo, O., has published a folder entitled "Furnaces for Agricultural and Road Equipment". Text describes hardening, drawing and annealing furnaces for tractor parts; convection type air drawn furnaces for harrow disks and clean hardening and gas carburizing furnaces for tractor parts.

PYROMETER — Brown Instrument Co., Philadelphia, has published a booklet on its automatic optical pyrometer for measuring surface temperatures of hot bodies in motion and at rest. The publication explains the principle of operation, constructional features, chart ranges, and applications of the optimatic system.

NICKEL—"400 Practical Applications for Monel, Nickel, and Inconel under Corrosive Conditions" is the subject of a 28-page booklet recently issued by the International Nickel Co., Inc., New York. Tabular data is presented on definitely established uses of the three metals to resist the corrosive actions of more than 400 chemical and corrosive products.

CUPOLA CHARGING—Edwin S. Carman, Inc., Cleveland, O., has issued a leaflet describing its engineering services to foundrymen.

ROPE—Broderick & Bascom Rope Co., St. Louis, has issued a booklet illustrating wire rope slings, splicings, sockets, links, rings, and other fittings. Proper methods for handling and coiling rope are also described.

ELECTRIC FURNACES — American Bridge Co., Pittsburgh, has issued an illustrated booklet describing its electric furnaces for steel mills and foundries. Types, sizes, and capacities regularly furnished are listed in convenient tabular form.

HARDNESS TESTER—Louis C. Eitzen Co., 280 Broadway, New York, has issued a folder describing its portable brinell meter. The principle of operation is fully described, and an illustration shows the complete outfit included in a carrying case.

MATERIAL HANDLING — Cleveland Crane & Engineering Co., Wickliffe, O., has available for distribution a bound group of twelve folders issued singly in the past and dealing with methods and equipment for handling materials in practically all types of industrial plants.

DIESEL ENGINES—Caterpillar Tractor Co., Peoria, Ill., has issued a new booklet describing the mechanical features of its diesel engines. Maximum and rated performance curves are included, and model shots and explanatory mechanical cutaways of the engines are shown.

NONFERROUS FLUXES—A small catalog of its nonferrous foundry fluxes has been prepared by the Pittsburgh Metals Purifying Corp., P. O. Box 6131 N. S., Pittsburgh. Action of the fluxes in removing gases and oxides from the metal is described. Uses of the different fluxes with various alloys are explained.

CRUCIBLE FURNACES — Fisher Furnace Co., 1818 North Lamon avenue, Chicago, has published a catalog and price list of its stationary crucible melting furnaces which contains capacity tables and specifications. Specifications and blower data on tilting type furnaces manufactured by the company are also included.

WIRE CABLE—American Cable division, American Chain & Cable Co., Inc., Wilkes-Barre, Pa., has issued a 32 page booklet entitled "Greater Dollar Value." It includes information of much value to drillers, loggers, miners, contractors, plant superintendents, building owners interested in elevator cable, and other wire rope users.

WIRE ROPE—"Wire Rope's Natural Enemies" is the title of a 28 page, pocket size booklet recently published by the Hazard Wire Rope division, American Chain & Cable Co., Inc., Wilkes-Barre, Pa. It describes the effects of kinking, sheaves, reverse bends, whipping, abrasion, and other enemies of wire rope in simple, nontechnical language.

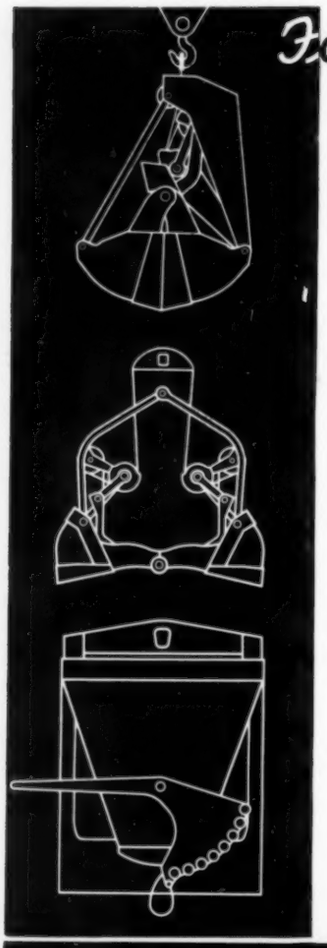
METAL WORKING LATHES—South Bend Lathe Works, South Bend, Ind., has

(*Concluded on page* 100)

BLAW-KNOX

BUCKETS

For Foundry Service



The popular hook-on bucket for handling sand, coke, coal, etc. Adaptable to a broad range of service and multiplying the value of your crane investment.

A Hook-on type of bucket built especially to meet the requirement of extremely limited head room clearance for operation.

The roller gate dump bucket presenting the first practical means of obtaining controllable discharge for delivering sand to floor or flasks, etc.

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Hi, Fellas! I'm Bill Gagger!
I'm gettin' my picture in the papers because of the kind of guy I am, always helpin' the other guy to get BETTER CASTINGS for LESS MONEY.
Watch for my messages.

We Manufacture

Seacoals, 10 different grinds.

Core Compounds, Plumbagos, Blackings, Core Washes - - in grades for every purpose.

Parting Compounds: Tripoli, Non-Silica, Liquid.

Core Paste, Paste Binder, Dust-On Facing, Special Facings and Compounds to fit any job.

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RADIANT FACINGS Since 1879

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UPRIGHT METALLURGICAL MICROSCOPES WITH THE ULTROPAK

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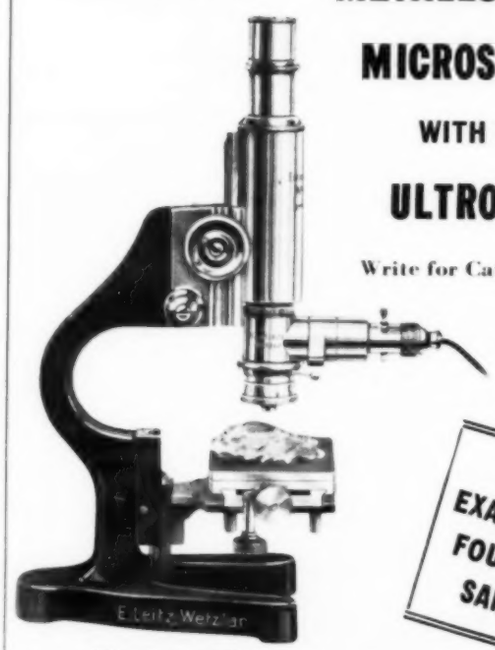

Microscope "UH"

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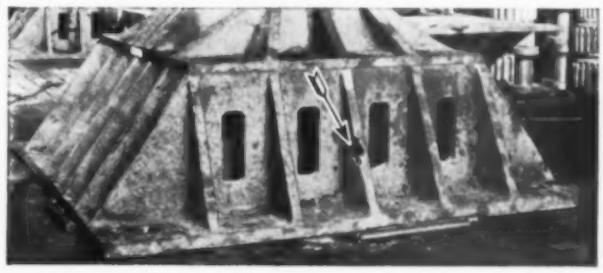
(Makers of the famous LEICA Cameras) WASHINGTON · CHICAGO · DETROIT
Western Agents: Spindler and Sauppe, Inc., Los Angeles - San Francisco



This happens in the best of foundries

— but surface flaws mean nothing when filled with

SMOOTH-ON No. 4

YOU may mould, heat and pour with every care and efficiency device known to the foundry art—but every casting won't come out flawless.

But you can and are entirely justified in removing every trace of sand holes, blow-holes and surface spots at locations not subjected to vital strains.

Smooth-On No. 4 fills such depressions with metallic iron of the same surface contour, texture and color as the surrounding metal—and it performs the honorable and truly necessary function of giving your customer better value.

Proper use of Smooth-On No. 4 legitimately diverts a goodly number of castings from the hopeless class, with corresponding larger profits.

Proving this would cost you only a few cents and no effort. Seldom is 1 ounce of Smooth-On No. 4 necessary to a ton of castings, and the saving on this ton will pay for more Smooth-On than you can use in a year.

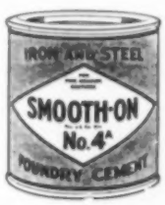
Three compositions, each with distinct color, degree of lustre and fineness of grain offer a choice for perfect match in iron and steel castings of any shade, appearance and quality.

Smooth-On No. 4AA. For light gray castings and machined surfaces. Has high metallic lustre and takes a fine machine finish

Smooth-On No. 4A. For medium gray castings. A fine-grained cement that has a good metallic lustre

Smooth-On No. 4B. For dark gray castings. A cement of coarser grain and darker shade

Make a critical test, and you will find your filling problems well solved.



FREE HARDENED and WORKING **SAMPLES**

Smooth-On Nos. 4AA, 4A and 4B is packed in 1-lb. and 5-lb. can, 25-lb. pail or 100-lb. keg. Mail coupon for prices and free hardened and working samples.

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Please send samples of ☐ Smooth-On No. 4AA ☐ Smooth-On No. 4A ☐ Smooth-On No. 4B

Name.....

Address.....

4-38

Do it with **SMOOTH-ON**

(*Continued from page* 98)

announced a new illustrated, 72 page general catalog, No. 97, which describes its entire line of back-geared, screw-cutting, metal working lathes. Also illustrated is its complete line of attachments, chucks, and tools.

PYROMETERS — C. J. Tagliabue Mfg. Co., Park and Nostrand avenues, Brooklyn, N. Y., has published a 28-page pyrometer catalog which describes and illustrates indicating, recording and controlling pyrometers and resistance thermometers which utilize a phototube, mirror galvanometer and a beam of light.

PYROMETERS — Brown Instrument Co., Philadelphia, has issued a new folder entitled "Legibility plus Precision." Printed in seven colors, it reproduces the colored numeral records, exactly as they are printed on the charts of the company's potentiometer pyrometers recorders, and explains their method of recording several overlapping temperature changes on one chart.

DEWATERING TANKS — Claude B. Schneible Co., 3951 Lawrence avenue, Chicago, has issued a bulletin on its new rectangular type multi-louver dewatering tanks for precipitating and dewatering sludge from its multi-wash dust collectors. A description of the tank is given and data on capacities in gallons, approximate dimensions and weight in pounds are included.

ANNIVERSARY — Sidney Flavel & Co. Ltd. Leamington and London, England, has published an interesting book entitled "How We Build", commemorating 160 years of progress on the part of the company. The work is exceptionally well illustrated featuring a number of pictures of foundry operations as well as illustrations of the products of the company.

TEMPERATURE CONTROL — A new bulletin describing temperature recorders and controllers for furnaces and kilns and for industrial ovens, has been issued by the Bristol Co., Waterbury, Conn. The bulletin contains information on potentiometer and millivoltmeter type pyrometers and controllers, as well as descriptions of a line of thermometer recorders and controllers.

OPTICAL PYROMETER —Pyrometer Instrument Co., 103 Lafayette street, New York, has published bulletin No. 80 describing in detail its optical pyrometers suitable for varied and exacting requirements of scientific laboratories as well as for heavy duty shop practice. The company also has published a folder containing an article "The Pyrometer in the Gray Iron Foundry" by William A. Huber.

FERROUS FLUXES—Pittsburgh Metal Purifying Corp., P. O. Box 6131 N. S., Pittsburgh, has published a leaflet describing the uses and advantages of its cupola flux, carbon free liquidizer, and iron ladle flux. Claims of the cupola flux to reduce melting costs, of the liquidizer to decrease porosity and eliminate cavities, and of the ladle flux to produce easily machined castings are explained.

INDUSTRIAL LIGHTING — A new folder describing construction and application of its heavy duty industrial lighting units has been issued by the lighting division, Westinghouse Electric & Mfg. Co., Cleveland, O. Various tests illustrating the ability of the unit to withstand abuse are included. A table of mounting heights, spacing and resulting footcandle intensities is useful for application data.

FOUNDRY PRACTICE — "Foundries Around the World" is the title of a booklet issued by the Beardsley & Piper Co., Chicago. The book contains 36 pages of interesting experiences in foundries visited by the company's vice president and treasurer, W. F. Piper, in a 40,000 mile trip through the Orient, Asia, Africa and Europe. It was originally produced as a series of letters in the company's house organ.

Faked Foundry Facts

"Eccentric Clamp"

And Transite Core Plates not only increase production capacity . . . but provide protection against breakage, warpage and corrosion

Johns-Manville TRANSITE CORE PLATES

JM PRODUCTS

THERE'S REAL ECONOMY in using *lightweight* core plates! They make for easier handling . . . step up production . . . and sizably reduce your labor and maintenance expense.

Johns-Manville Transite Core Plates weigh only about a quarter as much as metal of equal thickness. This means that a foundry worker can handle twice as many plates in less time and with considerably less effort.

Transite's other advantages are equally important. Made of a specially treated asbestos-cement combination, these durable core plates cut down on breakage losses. Being non-metallic, they *cannot corrode* . . . they retain their smooth surface year after year. And warping is practically eliminated.

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